RETURNS TO FARM REAL ESTATE:
ANALYSIS OF AN ILLINOIS FARMLAND PORTFOLIO

BY

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THESIS

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ABSTRACT

Previous research on returns to farmland derived data from aggregate U.S. or regional sources. A distinction of this document is that an actual portfolio of Illinois farms are evaluated. This thesis extends past research by analyzing a longer and more current period. The results suggest that Illinois farmland pays a substantial premium above what is required for systematic risk and that its returns are negatively correlated to most major asset classes. Illinois farmland adds very little risk to a well-diversified portfolio and is a hedge against inflation.

To my beloved wife, Rebecca J. Noland.

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CHAPTER 1

INTRODUCTION

Introduction

The University of Illinois (UI) operates an endowment pool of financial assets to provide income to the colleges and departments that are the beneficiaries of donors' bequests. The individual accounts consist of two types: 1) strict endowments from which the *corpus* can never be spent and 2) quasi-endowments that may be completely spent but for which the beneficiary college or department has opted to defer spending the *corpus*. The UI Treasury Operations office is responsible for maintaining a long-term investment horizon for these investment balances. An endowment pool investment policy developed by senior UI business officers, with assistance from an external investment advisor, is reviewed periodically and approved by the investment policy committee of the Board of Trustees of the UI. The endowment pool investment policy guides those responsible for its execution in the pursuit of a rational level of return with a prudent level of risk. The policy has typically required a mix of stocks and bonds. A small private equity allocation was added in the last decade in order to benefit from the innovations of UI faculty as these designs move from the laboratory to the marketplace.

The UI has been the beneficiary of an unplanned portfolio of endowment farmland since the first farm was received in 1923. The size of the UI farmland portfolio peaked in 2007 with 21 endowment farm gifts consisting of approximately 11,900 acres under professional in-house management. The entire portfolio is located in central and north-central Illinois. The farms received accounting treatment as separately-invested endowments until January of 2007. Separately-invested endowments stand alone outside of the endowment pool and distribute net

income directly to the beneficiary college or department. Endowment pool participants, on the other hand, receive a monthly income stream from the diversified pool of which it owns shares.

In 2007, one of the farms was strategically transitioned from separately-invested endowment to become the cornerstone of a new farmland asset class in the endowment pool. The former recipient of that farm's income began receiving its monthly income distribution from the endowment pool, and the net farm income was paid into the endowment pool. Anecdotal evidence hinted that farmland would have a favorable impact on the endowment pool, and the UI's investment advisors agreed that it would be a prudent decision. This single farm was 7% of the total endowment pool market value when it was added in January of 2007. The Board of Trustees of the UI granted approval to add farmland up to 15% of the total pool value.

Most of the farms in the UI farmland portfolio were given for the benefit of the College of Agricultural, Consumer and Environmental Sciences (ACES). The farmland portfolio has been assembled without a thorough investigation of how the College of ACES can make the most of these generous gifts. Without undergoing an intensive analysis, the UI cannot ascertain whether the College of ACES and other beneficiaries should "divest" some farmland and invest the proceeds in the UI's diversified endowment pool. Conversely, it is possible that UI colleges and departments that participate in the endowment pool would be better served by the addition of more separately-invested endowment farmland into the UI's endowment pool.

Farmland as an asset class has the necessary characteristics required to evaluate its financial return. To wit, a history of annual income return is traceable and a process can be developed for estimating the value of the farmland that generates the income. With these data in place, cash return, appreciation return and total return can be calculated. The variability in farmland returns can be measured to better understand its risk characteristics. Farmland returns

and variability of returns can be compared with other asset classes and inflation to gauge how they move together over time. Understanding these relationships can assist decision makers who are charged with maximizing endowment returns while working within risk constraints established by the UI investment policymakers. It is hoped that this study will yield valuable insight into these challenging issues.

These concerns have a broader impact than just on the UI and its decision makers. Pension fund managers, endowment managers, institutional investment advisors, private investors, farm operators, agricultural lenders and academics are among the parties interested in the investment qualities of farmland. Indirectly affected by farmland returns are equipment manufacturers and dealers, grain merchandisers and processors, fertilizer and chemical companies and the many people who labor in these organizations.

There is a great deal of anxiety in many quarters about the future investment performance of traditional asset classes. This has led to unprecedented interest in the return and risk component of farmland and in the short and long term influence it has on investors' portfolios. A considerable number of academic studies have evaluated farmland to define its investment potential. This research contributes to the body of literature on this important topic.

Problem Statement

The chaos in the financial markets in 2008 and 2009 led to a renewed interest in asset classes that have been overlooked by most mainstream investors. U.S. farmland provided stable income streams and reasonable market value stability during a time of great volatility in the credit markets.[1] Some of Illinois' farmland is arguably the most fertile and productive land in the world. The UI College of ACES, other UI endowment farm beneficiaries, institutional

[1] Hilary Potkewitz. "NY Investment Firm Gaga for Green Acres." *Crain's New York Business.com*. 12/29/2009.

investors, pension funds, individual investors, farmers and lenders can benefit from updated information regarding Illinois farmland's financial performance; this information is useful in determining whether it should have a place in a well-diversified portfolio. Important questions include the following:

- What has been the historical return of the UI farmland portfolio?
- How does the UI farmland portfolio interact with other asset classes within a diversified pool of investments to affect the portfolio's risk and return results?
- What percentage of the UI's endowment pool should be invested in farmland? What does this result suggest for other institutional investors and individual investors?
- Is farmland an inflation hedge?
- Does farmland provide returns in excess of levels required to compensate investors for risk?
- What are the implications of examining a live portfolio of farmland compared to past studies that used aggregate data from different periods and/or widely dispersed geographic areas?

If this study reaffirms the favorable impact farmland has on an already diversified portfolio, as past studies have shown, then the potential exists to improve portfolios' capacity to withstand inflation and shocks to the financial markets with less volatility of returns.

Objectives

The following objectives are pursued in this thesis:

1. Create a database of farmland returns from annual records

2. Comparison of mean and standard deviations of farmland to returns of other asset classes
3. Evaluation of whether farmland contributes to a well-diversified portfolio
4. Analyze the degree to which farmland contributes to systematic risk
5. Assess the impacts of inflation on farmland returns

Outline

Chapter 2 reviews relevant research literature to describe the research that has been done on this and closely related topics. This review endeavors to either identify an opportunity to update research that is possibly outdated or to discover a gap in the research that has never been thoroughly studied. The literature review explores the methodologies used in past studies and reveals the effectiveness of those models to obtain robust outcomes.

Chapter 3 comprehensively describes the data set and how it was organized for evaluation. Summary return data are explained for each UI farm and for the total farmland portfolio. Acreage and soil fertility characteristics are provided for each farm.

Chapter 4 reveals the analytical methods applied to the data from which conclusions are drawn. The processes and formulas applied to historical data are explained in detail.

Chapter 5 illustrates the results from the methods described in Chapter 4. Examples are provided of live data inserted into these models and how the output is evaluated.

Chapter 6 summarizes the results and makes any noteworthy conclusions about this study. Opportunities for further research are discovered during the process of assembling this study, and these are listed in this chapter.

The next chapter reviews a chronological trail of foundational research on which this study is based.

CHAPTER 2

REVIEW OF RESEARCH LITERATURE

Introduction

This chapter reviews historical research on the topic of returns to farmland. The intent is to provide a brief background on data and methods used to understand risk and return on investments in farmland. The review process summarizes literature that evaluated farmland returns and compares these returns to other investment classes. Seven scholarly studies examined below span the period of 1970 to 2005.

Johnson (1970) "Returns to Farm Real Estate"

Johnson (1970) examined the relationship between farmland market values and current farmland returns. This relationship was analyzed primarily from the perspective of the farm operator.

U.S. Department of Agriculture (USDA) studies were the data source. USDA divided farms into five economic classes based on their annual gross sales. In the context of this article, residual data uses the idea of rent theory to label land income as a surplus of returns after other factors of production have been paid – namely, labor, management and other capital. The U.S. Census of Agriculture report was used to calculate proportional estimates of income assigned to land or non-land factors of production where residual data was unavailable. Johnson noted that average rates of return increased with farm size in the 1960-1969 timeframe.

Johnson drew on the residual method of calculating farmland returns, which is based on rent theory. He states that "in this concept, land income is a residual or surplus of returns after

other factors of production are paid."[2] Those other factors subtracted from gross farm income are labor, management and non-real estate capital.

Larger farms are intuitively perceived to be more efficient than their smaller counterparts. Johnson's results confirmed that the category of largest farms, those found to have annual gross sales of $40,000 or more, produced average residual returns of more than double the 48-state average. Residual returns or net income returns to farm real estate averaged between 3% and 4% during the 1960s. Johnson reported that farm real estate appreciation averaged 5.3% per year for the ten years ended November 1, 1969.

Melichar (1979): "Capital Gains versus Current Income in the Farming Sector"

Melichar (1979) analyzed the importance and sources of farm asset appreciation during the period of 1954 to 1978. He intended to confirm that rising real farm income during this period was the driving force behind the growth in real farmland values. USDA sources provided the author with aggregate farmland values and current returns for the nationwide farming sector.

The author suggested flaws in the longstanding assumption "that, in theory, land prices should be related to 'income'." He posited that "aggregate income is being regarded as a return to real estate alone, ignoring other productive assets."[3] Melichar chose to replace farm real estate values with the aggregate USDA series named "farm production assets".

Melichar ultimately used asset-pricing theory to illustrate the three primary variables upon which real capital gains or losses are dependent. His formula showed that any change in the asset growth rate, discount rate or the current return would create a new equilibrium value in

[2] ‚Johnson, Bruce. "Returns to Farm Real Estate." *Agricultural Finance Review*. 31(1970): p. 27.
[3] Melichar, Emanuel. "Capital Gains versus Current Income in the Farming Sector."*American Journal of Agricultural Economics.* 61,5(1979): p. 1087.

the underlying asset. The amount of change in the equilibrium value is the capital gain or loss. The discount rate is a proxy for inflation.

Melichar found that although the nominal appreciation of farm assets generally exceeded net farm income by a great extent in the 1970s, inflation-adjusted capital gains roughly equaled net income during that decade. Growth in farm income necessarily results in a corresponding capital gain if all other variables are constant.

The author was an economist with the U.S. Federal Reserve System, and his conclusions reflected an understanding of the effects of public policy on the financial performance of farm real estate. He stated that policy actions intended to advance the growth rate in current income ultimately result in higher capital gains, exacerbating the low current returns the policy was attempting to address.

Barry (1980): "Capital Asset Pricing and Farm Real Estate"

In a seminal study, Barry (1980) introduced the capital asset pricing model (CAPM) as a tool to evaluate risk premiums required to invest in farmland in the context of a well-diversified market portfolio. CAPM generally defines an expected return of an asset as the risk-free rate of return plus a risk premium for that asset. A risk-free asset is one with a certain future return, such as the 90-day U.S. Treasury bill. Investors with a diversified portfolio should require compensation (i.e., the risk premium) for risk that each asset adds to the whole. Some risk is mitigated via diversification but the remainder, systematic risk, is the total market portfolio risk that requires compensation for the investor.

Barry used U.S. Department of Agriculture data for farm real estate values. Data for other asset classes came from the U.S. Department of Commerce, Standard and Poors and the

Federal Reserve Board of Governors *Federal Reserve Bulletin*. His study concluded that investment in farm real estate added little systematic risk to a well-diversified market portfolio for the 1950-1977 period. Further implications were that investment in farm real estate added substantial premiums above systematic risk, especially for well-diversified portfolios. The CAPM approach faltered in its treatment of inflation by failing to adequately estimate its effects on the asset classes studied. The CAPM deficiency may be especially noted in Barry's results during the relatively high inflationary years of the mid to late 1970s when farmland prices outperformed some stock and bond indices. This may partially explain the superior performance of farm real estate versus the total portfolio and most individual asset classes.

Kaplan (1985): "Farmland as a Portfolio Investment"

Kaplan (1985) studied the return and diversification attributes of farmland to determine whether it would fit within a diversified portfolio of assets. If farmland enhances the risk and return characteristics of a portfolio, in which parts of the U.S. should properties be acquired?

Kaplan gathered data for the 1947-1980 timeframe. Farmland return data were obtained from USDA; large capitalization stocks, small capitalization stocks, long-term corporate bonds, long-term government bonds and U.S. Treasury bills data came from Ibbotson and Sinquefield (1982). Consumer Price Index (CPI) data came from the U.S. Department of Commerce, Bureau of Labor Statistics.

The author compared return series for each asset class he evaluated and calculated means, standard deviations, and correlation coefficients. CPI data were also compared to each asset class. Kaplan used Markowitz optimization to develop a diversified portfolio of farmland from 81 crop regions in the U.S.

Farmland was determined to be an excellent hedge against inflation. Its returns were not significantly correlated with any asset class examined except for the U.S. Treasury bill index. On a total return basis, farmland performed as well as or better than every asset class except small cap stocks.

Kaplan noted that unlike large capitalization stocks, farmland inherently did not have an efficient exchange of sale information nor were farm properties a homogeneous asset that could be easily evaluated. Twenty-five years of net income data for 81 regions were used to develop an optimal portfolio containing properties from 13 of those regions. Almost 72% of the farmland recommended by the optimization calculation was in 5 of the 13 regions. The author suggested that for the sake of management efficiency, risk and return objectives could be adequately met by acquiring farmland in only those five regions.

Irwin, Forster and Sherrick (1988): "Returns to Farm Real Estate Revisited"

Irwin, Forster and Sherrick (1988) evaluated farmland return and risk using USDA data for the agricultural sector across the United States. The authors' objectives were to expand on research by Barry (1980) by thoroughly gauging the effects of uncertain inflation on a portfolio, widening the complexity of asset classes within that portfolio and expanding the sample period to 1947-1984. Uncertain inflation was defined as the difference between the consumer price index and the risk-free rate of return. The traditional CAPM model consists of the following elements:

$$E(R_j) = R_f + \beta_j[E(R_m) - R_f]$$

$E(R_j)$ is the expected rate of return on asset j, R_f is the risk-free rate of return, $E(R_m)$ is the expected rate of return on the market portfolio and β_j is the systematic risk associated with asset j.

Irwin, Forster and Sherrick created a model that expanded the sample period and added an inflation factor to the CAPM formula:

$$E(R_j) = R_f + \beta_{1j}\,[(E(R_m) - R_f)] + \beta_{2j}\,[(E(\pi) - R_f)]$$

In the revised formula, β_{1j} is the systematic risk associated with asset j, β_{2j} is the inflation risk of asset j and $E(\pi)$ is the expected rate of inflation.

The expanded model included three reasonably profitable farming years from the post-World War II era and the farm bust years of the early 1980s. The regression model confirmed Barry's conclusion that the addition of farm real estate to a well-diversified portfolio added little systematic risk. However, the results revealed that farm real estate added only a small premium over returns for systematic risk. Furthermore, investment in farm real estate appeared to have significant risk from uncertain inflation. The authors acknowledged that an analysis of such a large geographic dispersion tended to understate risk inherent in farmland portfolios that were typically concentrated to a more limited region. The use of USDA aggregate cash rents likely resulted in smoothing bias.

Lins, Sherrick and Venigalla (1992): "Institutional Portfolios: Diversification through Farmland Investment"

Lins, Sherrick and Venigalla (1992) investigated the appropriateness of adding farmland to institutional investment portfolios. If they found that farmland would enhance the risk and return characteristics of a portfolio, the authors intended to make further recommendations regarding the farmland assets to add.

The authors gathered returns data from Ibbotson and Associates for common stocks, long-term corporate bonds and business real estate. Total returns for farmland were calculated from USDA data by combining cash rents and capital gains as percentages of land value and removing real estate taxes as a percentage of market value. These data from USDA were available for 28 states in the 1967-1988 period studied by the authors.

Farmland data were compiled by state and mean returns, standard deviations and correlations with common stocks, long-term corporate bonds, business real estate and inflation were calculated. Testing was conducted to measure for "appraisal bias" in the valuation process for farmland. The authors ultimately concluded that if appraisal bias was present, it produced only a minor effect on optimal farmland portfolios.

Finally, the authors conducted optimization exercises to determine the farmland holdings for these scenarios:

- An optimized farmland portfolio selected from the 28 states without regard for the remaining investment portfolio of common stocks, long-term corporate bonds and business real estate.
- An optimized farmland portfolio included within a larger optimized portfolio that included common stocks, long-term corporate bonds and business real estate.
- A constrained optimization routine was conducted to limit the upper bound of farmland from any single state within the overall portfolio to 10%.
- A constrained optimization routine was conducted to limit the upper bound of farmland from any single USDA region within the overall portfolio to 10%.

- A constrained optimization routine was conducted to limit the upper bound of farmland from any single USDA region to 20% of the farmland allocation and to limit the overall farmland allocation to 10% of the total portfolio.
- Two final optimization routines doubled the return variances for farmland and decreased the total returns by 300 basis points.

Farmland outperformed stocks and bonds in the period of 1967-1988 with negative correlation to those asset classes and positive correlation to inflation. Lins, Sherrick and Venigalla reported that in the last five exercises described above, farmland was a dominant part of the overall optimized portfolio. Noting that managers of institutional portfolios did not make farmland the dominant asset within their portfolios due to liquidity concerns, management fees and transaction costs, the authors nonetheless opined that including farmland within institutional portfolios did indeed improve its risk and return characteristics while providing a hedge against inflation.

Libbin, Kohler and Hawkes (2004): "Does Modern Portfolio Theory Apply to Agricultural Land Ownership? Concepts for Farmers and Farm Managers"

This article examined the application of portfolio theory and the CAPM for diversification strategies that went beyond the on-farm variations that many farm operators used to spread risk. The authors observed a tendency for farm operators and farm owners to make minimal use of financial diversification techniques to manage risk. Even worse, on-farm activities seemed to lean toward greater specialization in order to more effectively manage expenses and output prices. The article asked if greater diversification might be a better strategy since the goals of most farm operators are to maximize their income and to decrease its variability.

At a very basic level, investors want high returns and low volatility of those returns. Portfolio theory attempts to address these goals by identifying two types of risk associated with volatility of returns: 1) market or non diversifiable/systematic risk and 2) stand-alone or diversifiable/non-systematic risk. Only the diversifiable risk can be reduced by adding investments that have a low correlation of returns with the rest of the portfolio. The authors briefly described the process for creating efficient portfolios that maximized returns for an acceptable level of risk. The "acceptable" level of risk is unique to each investor and may be difficult to quantify with pinpoint accuracy. CAPM concluded that the pertinent risk of a particular asset was the amount of risk it added or subtracted from a diverse portfolio of investments.

Even though not proven through new empirical evidence, the authors concluded their review of relevant studies with the opinion that CAPM analyses supported the inclusion of financial assets and real assets together in a well-diversified portfolio that enhanced its return and risk characteristics.

Hennings, Sherrick and Barry (2005): "Portfolio Diversification Using Farmland Investments"

Hennings, Sherrick and Barry (2005) designed a study to determine whether the inclusion of farmland in a mixed asset portfolio improved its risk and return values. This study considerably expanded the analysis done by Lins, Sherrick and Venigalla (1992) by enlarging the universe of possible asset classes to include in an optimal portfolio and by updating the period under evaluation.

Return data were gathered for government bonds, U.S. Treasury bills, domestic common stocks, corporate bonds, foreign equities, interest rate indices, real estate investment trusts

(REITs), commodity indices, cash rents for cropland and farmland valuation indices from the National Council of Real Estate Investment Fiduciaries (NCREIF). Most of the data were available for the 1972-2003 period. Farmland values data came from the National Agricultural Statistics Service of the USDA, and cash rent estimates were acquired from USDA. Farmland data were compiled by state before mean returns, standard deviations and correlations with the expanded list of asset classes were calculated.

The authors conducted several optimization exercises to determine the farmland holdings for these and other scenarios:

- Optimized farmland portfolios were selected from the individual states and from the six USDA geographic areas independent from the remaining mixed asset portfolio.
- An optimized farmland portfolio included within a larger optimized portfolio that included the expanded list of asset classes.
- Constrained optimization scenarios that limited the farmland allocation through either an upper bound on each state's contribution to the portfolio or an upper bound on the investment in REITs.
- Six regional NCREIF indices were added as proxies for the farmland asset class and constrained optimization exercises were conducted.

The authors confirmed the results of previous studies by concluding that farmland returns were indeed negatively correlated with stocks and bonds and positively correlated to inflation. Each optimization exercise performed by the authors resulted in farmland holding a dominant part of the optimized portfolio's asset allocation in spite of the addition of a spate of new asset classes. The authors concluded that adding farmland to investment portfolios had historically improved risk and return characteristics while providing a hedge against inflation.

Summary

Overall, the following summary can be drawn from the studies described above:

1. Determining returns from farmland is difficult.
2. Farmland returns appear to be influenced by inflation.
3. Returns to farmland have been comparable in a risk sense to that of other financial assets.

The studies used CAPM and optimization theory to evaluate and draw conclusions from generally farm level data. These robust tools are appropriate to consider in analyzing the data described in the next chapter, although a modified CAPM that incorporates inflation risk may be the best option. The process is similar in some aspects to the model used by Irwin, Forster and Sherrick (1988). The return and risk characteristics of farmland were generally found to be favorable when compared with other asset classes. Returns to farmland were found to be somewhat positively correlated with inflation and negatively correlated with returns in most other asset classes.

Methods for pricing farm real estate are obviously important due to their direct effect on the cash return performance of the asset class. The relationship between net farm income and market values are analogous to the price/earnings ratio of common stocks.

This thesis will strive to add value to the body of agricultural finance knowledge by focusing on the following two distinctions in order to contribute a useful expansion on previous studies:

1. The past studies evaluated timeframes that are now somewhat outdated.

2. In every study evaluated above, estimates of farm net income were used. The research to follow differs by using more complex cash return data from an actual portfolio of Illinois farms.

CHAPTER 3

DATA

Introduction

Farmland returns consist of two primary elements – the current income or "cash" return earned on a farm's production and capital gains or losses resulting from changes in a farm's value. This chapter provides background on the University of Illinois (UI) farm management practices and a description of each farm property in the UI farmland portfolio. The process of accounting for each farm's financial performance is explained in detail. Sources for other data are described and formulas for calculating returns are explained. Summary statistics highlighting each farm's return are provided.

Professional farm management was first used at the University of Illinois when the Carter-Pennell farms were donated to the University in 1923. Management was delegated to the Department of Agricultural Economics in the College of Agriculture and was handled by Dr. H. C. M. Case, Head of the Agricultural Economics Department. As gifts of endowment farms were added over the years, a separate unit called the Agricultural Property Services (APS) office was created within the College of Agriculture to manage the endowment farms. Following Professor Case (1922-1933) as manager of the endowment farms were M. L. Mosher (1933-1944), J. B. Andrews (1944-1953), J. B. Cunningham (1953-1961), Donald G. Smith (1961-1987), and Dennis W. Gehrt (1987-2006). As the number of endowment farms grew, a second farm manager was added to the APS office. Jonathan Norvell began as a graduate assistant in the APS office in 1987 and was hired as a full-time farm manager in 1989. Dr. Norvell achieved the Accredited Farm Manager designation and continues to fill the farm manager role as of the date of this writing. In 2005, the president of the UI determined that he

wanted the APS office to be part of his administration. The best fit was considered to be within Treasury Operations, a unit of the UI Office of Business and Financial Services.

Potential gifts of farmland are inspected for environmental problems or any other issue that would prevent the gifts' acceptance from being in the UI's best interests. If this review discovers no significant problems, the process for title transfer to the UI commences. All active fundraising is now coordinated through the UI's fundraising arm, the University of Illinois Foundation (UIF). As a result, most gifts of farmland currently come to the UIF and are managed by its external farm management firm. The APS office has minimal involvement with UIF farms.

A map of the UI endowment farms is shown on the next page in Figure 3.1. A list of the endowment farms with the year of the bequest and the donor's purpose for the gift is outlined in Table 3.1.

Figure 3.1. University of Illinois Endowment Farms Donated by 1976 or Earlier.

1. Allerton Farm–4 units–Piatt County
   3,844 total acres
   3,379.5 tillable acres

2. Campbell Farm–DeWitt County
   86 total acres
   85.2 tillable acres

3. Carter-Pennell Farm–Vermilion County
   346 total acres
   319.3 tillable acres

4. DeHart Farm–Moultrie County
   120 total acres
   116.2 tillable acres

5. Hackett Farm–Douglas & Moultrie Counties
   416 total acres
   364.6 tillable acres

6. Hubbell Farm–DeWitt County
   160 total acres
   157.2 tillable acres

7. Hunter Ag. Exp. Farm–Champaign County
   280 total acres
   243.9 tillable acres

8. Hunter Ag.Sch.Farms–4 units
   Menard, Macoupin, & Sangamon Counties
   1,256 total acres
   1215.5 tillable acres

9. Warren Farm–Piatt County
   120 total acres
   119 tillable acres

10. Weber Farms–2 units–LaSalle County
    800 total acres
    774 tillable acres

11. Wright Farms–3 units–DeKalb County
    893 total acres
    869.9 tillable acres

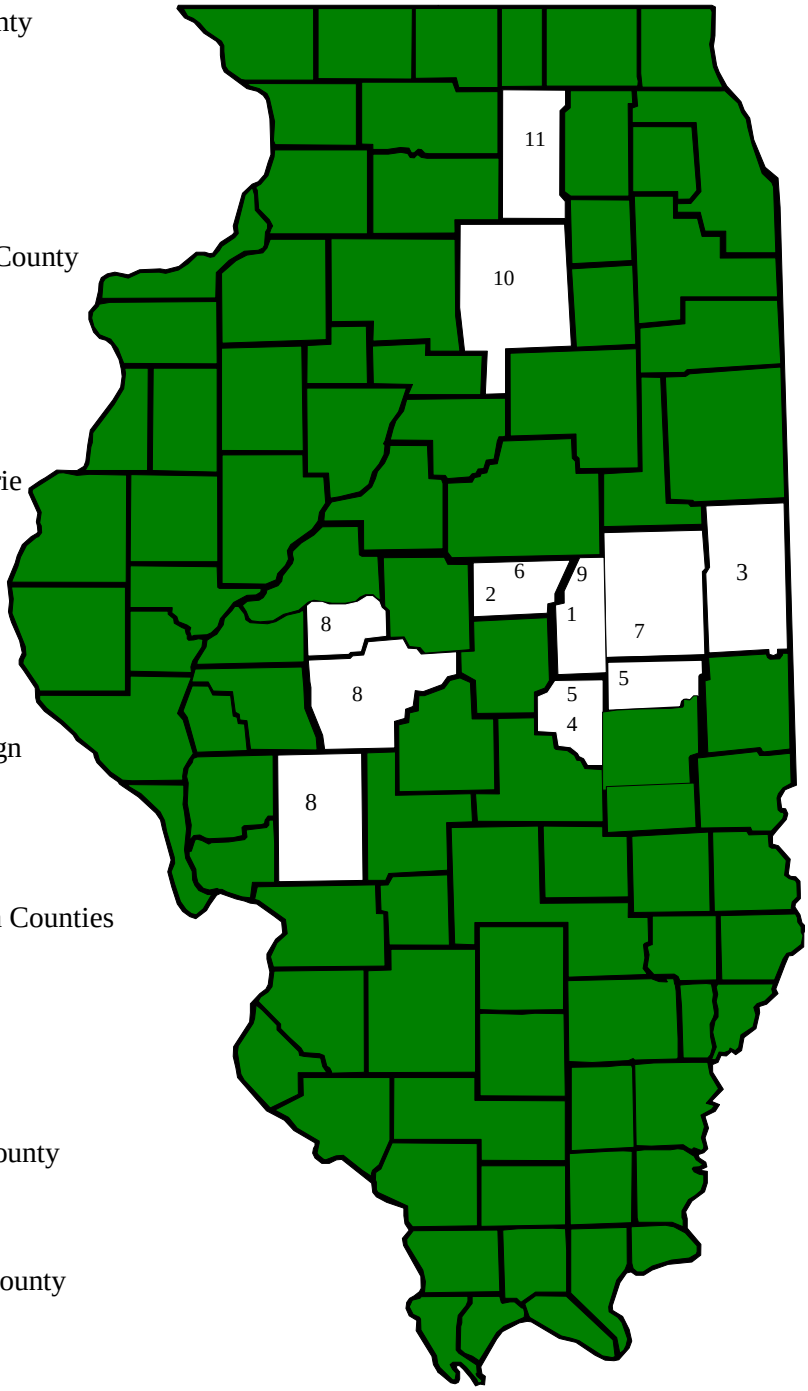


Table 3.1. University of Illinois Endowment Farms Donated by 1976 or Earlier.

Name of Endowment	Donor(s)	Total Acres	Year of Gift	Purpose of Gifts (How Income is Used)
Allerton	Robert H. Allerton	3,844	1946	Maintenance of Conference Center & Allerton Park
Campbell	Grace V. Campbell	80	1976	Scholarships for Illinois farm men & women
Carter-Pennell	Joseph Carter & Jane Pennell-Carter	346	1929	Student Loan Fund
DeHart	Carl A. DeHart	120	1975	Scholarships to students
Hackett	Jessie E. Hackett	416	1950	Graduate scholarships & fellowships
Hubbell	Alta E. Teter	160	1972	General educational purposes
Hunter	Ralph O. & Mabel F. Hunter	1,256	1975	Scholarships – College of Agricultural, Consumer & Environmental Sciences
Hunter #6	Ralph O. & Mabel F. Hunter	280	1975	Agricultural Research
Warren	Elizabeth H. Warren	40 80	1955 1996	Promotion of 4-H activities & for youth of Illinois
Weber	Laura M. Weber	800	1955	Benefit or use of College of Agricultural, Consumer & Environmental Sciences
Wright	Harry G. & Harriet Wright	893	1943	Agricultural education & scholarships
	TOTAL ACRES	8,315		

Farm Leasing History

Leases for the endowment farms were entirely one-year crop-share leases from 1923 through 2004. Leases were gradually modified beginning in the 1980s to decrease the owner's share of expenses for harvesting and herbicides. This was consistent with an overall trend in professional farm management that was gradually shifting a greater share of the expenses from farm owner to farm operator. Farm operators were experimenting with no-till operations, which required greater expenditures on chemicals for weed control. For this reason, the APS office

began capping the UI's share of herbicide expenses. Supplemental rents of $10 to $20 per acre were added to share leases between 1997 and 1999 to give the UI a larger share of the farm revenue. The APS office was instructed by UI senior administrators to open a subset of the farms to a competitive bidding process for cash rent leases for the 2005 crop year. This conversion to competitively bid cash rents took four rounds to complete and one group of farms remained to be bid for the first time at the end of 2008. During this conversion, some farms received a resulting one-time boost in net income in cases where part of the crop had been stored and sold in the first year of the cash rent. This may have made net incomes appear artificially high during the first year.

Several farm units were bid in early 2005. Three more annual bid cycles were completed in subsequent years. The current process used by APS has the following key elements:

- Bid approximately 1/3 of the farms each year on a rolling three-year cycle.
- The U.S. Dollar amount bid is not the only criteria, but it does receive a dominant weighting in the proposal scoring process.
- The incumbent farm operator must submit a bid but also has a "right of first refusal", which allows the operator to be awarded a new lease by matching the U.S. Dollar bid of the highest scored proposal.
- After the first two rounds of bidding, leases were renewed for one year for a maximum lease period of three to five years before rebidding. In some cases, cash rents were raised in ensuing years to reflect perceived changes in the cash leasing marketplace.

- The last two rounds of bidding have awarded three-year fixed cash rent leases, with a 20% deposit of the total rent due on December 1 of the year prior to spring planting. The remaining 80% rent must be paid by March 1.

The practice of competitively bidding cash rents has a number of vocal detractors and is likely to undergo further modifications in the future.

Accounting for Managed Farm Return and Effects of Inflation

Farm Net Income – Methods for Calculation

Endowment farm data were gathered and retained by APS with oversight from University Accounting and Financial Reporting (UAFR). UAFR meticulously calculates endowment farm net income from APS data using Generally Accepted Accounting Principles (GAAP). The GAAP formula for farm net income is as follows:

- **Farm Net Income** = **Revenues** (Grain Sales+Grain Inventory+Crop Loss/Damage Insurance Proceeds+Cash Rent+Miscellaneous (USDA payments, etc.))

  LESS

- **Expenses** (Buildings, Fence and Drainage Repairs+Depreciation+Fertilizer+Grain Drying+Crop and Liability Insurance+Management+Seed+Machine Hire+Taxes (current year estimate)+Taxes (prior year actual over/under estimated)+Miscellaneous+Weed & Insect Control)

UAFR's net income calculations for the annual endowment farm reports are fundamentally prepared on a GAAP basis. However, the primary purpose of these annual reports is to arrive at the net income amounts which should be made available for scholarships, loan

funds or other purposes the farms' donors intended with their gifts. UAFR uses a "modified" GAAP method for compiling these reports because if a large unexpected expense is incurred in the current calendar year (e.g., razing a farmstead or tiling a farm), it is generally treated as a deferred expense because of the negative effect it has on the income distribution. Because of this net result, expenses such as this are spread over 10-20 years in order to smooth the expenses, even though this method is not perfectly consistent with GAAP.

Even though the University of Illinois is exempt from most taxes, a "payment in lieu of taxes" equal to the real estate taxes is made to the respective county in which the farms are located. Discussions with county tax assessment supervisors have consistently suggested that they would pursue the farm operator/lessee for the tax payment if the UI did not make this voluntary tax payment. This is true for revenue-generating farm properties but not for experimental farms such as the Dixon Springs Agricultural Center, which is devoted primarily to research.

Farmland Values

Some farms were professionally appraised at the time the UI received title in order to determine their initial beginning of year asset value. For many years this was the "cost value" reported by UAFR and attempts to place a current market value on particular farms only occurred as needed. In the early 1990s the UI Treasury Operations staff began seeking benchmarks to which the endowment farms' financial performance could be measured. Treasury Operations is responsible for overseeing the UI's endowment investments. Those investments are awarded to institutional funds management firms whose respective return performances are compared to assigned benchmarks. The benchmarks are appropriate for the specific

management assignment; for example, a stock manager is benchmarked against the Standard & Poor's 500 Index. Discussions at that time related to potential farmland benchmarks resulted in a decision to use the Federal Reserve Bank (FRB) of Chicago Farmland Values for Region XI, East Central Illinois as a proxy for changes in the UI endowment farms' values. The FRB began providing these valuation reports in 1965 and it is developed using quarterly survey data from agricultural bankers. APS used the FRB data to create an annual index of farm value changes. For simplicity, this index will hereinafter be referred to as the FRB Index.

A reasonable starting value for each farm is a necessary first step. The APS office worked with UI Agricultural and Consumer Economics faculty to formally appraise each endowment farm. After the appraisals were completed in the early to mid-1990s, farm values were adjusted annually using the FRB Index. The APS office occasionally made further adjustments to the FRB Index value for a particular farm if recent farm sales near the subject farm supported a variance from the index value. APS used the Illinois Land Sales Bulletin, Farm Credit Services publications and other sources to find comparable sales with which to justify any variations from the FRB Index. The Illinois Land Sales Bulletin is a newsletter that reports on the sales of rural acreage across most of the state. APS used historical FRB Index values to deflate from the farm appraised values back to the year of the gift or to 1965, whichever was earlier.

In the summer of 2008, UAFR informed APS that a new statement from the Governmental Accounting Standards Board ("GASB") would be enforced by the UI's external auditors for the fiscal year ending June 30, 2009. This new statement, called GASB 52, requires that public universities that own endowment real estate report it at fair value on financial statements. GASB 52 further stipulates that fair value should be established via periodic

appraisals by certified real estate appraisers. APS elected to hire 1st Farm Credit Services' certified appraisers to obtain these appraisals. The farms were valued as of July 1, 2008 in order to coincide with the UI's fiscal year.

For purposes of this analysis, these appraised values are adjusted to 12/31/08 values by applying the 3rd and 4th quarter changes as reported by the FRB Index. Because APS utilized a thorough process for annually valuing the endowment farm portfolio prior to the requirement for external appraisals, the following two sets of data are averaged to reach the end-of-year farm values for this analysis:

- APS farm valuation data through 12/31/07 with the adjusted 1st Farm Credit Services appraisal valuation for 12/31/08.
- Adjusted 1st Farm Credit Services appraisal valuations for 12/31/08, with each prior year deflated by the FRB Index value for that year.

The indexing methods described above create a tendency for smoothing bias.

Formulas for Calculating Current Return, Capital Gains and Total Return

Current Return for Year 1 = Net Income for Year 1 / Farm Value at Beginning of Year 1. For example, the Allerton Farms net income for the 2008 crop year was $878,375 and the estimated value at the beginning of 2008 was $20,063,627. The quotient $878,375 / $20,063,627 equals a nominal current return for 2008 of 4.378%. The annualized current return for a series is the geometric return of the current returns in each year of the series. The process of calculating geometric returns captures the compounding effect of a series of returns. The formula is as follows:

$$R_j = \sqrt[n]{(1 + a_1)(1 + a_2) \cdots (1 + a_n)}$$

where R_j is the geometric return for asset *j* and *a* is the nominal return for years 1…*n*. For example, the Allerton Farms had current returns of 4.378% in 2008, 2.859% in 2007 and 2.977% in 2006. The cubed root of the product (1+0.04378)(1+0.02859)(1+0.02977) is 3.403%, which is the geometric mean of the series.

Capital Gains for Year 1 = (Estimated Farm Value at End of Year 1 – Estimated Farm Value at Beginning of Year 1) / Estimated Farm Value at Beginning of Year 1. For example, the Allerton Farms had an estimated beginning of 2008 value of $20,063,627 and an estimated ending of 2008 value of $21,668,717. The beginning of year value subtracted from the end of year value is $1,605,090. This difference divided by the beginning of year value of $20,063,627 produces an estimated capital gain of 8%.

The annualized capital gain for a series is the geometric return of the capital gain in each year of the series. The formula is as follows:

$$R_j = \sqrt[n]{(1 + b_1)(1 + b_2) \cdots (1 + b_n)}$$

Where R_j is the geometric return for asset *j* and *b* is the nominal return for years 1…*n*.

The Not-Seasonally Adjusted Consumer Price Index (CPI) values from the U.S. Bureau of Labor Statistics (ftp://ftp.bls.gov/pub/special.requests/cpi/cpiai.txt) are used to convert nominal values to real values. An argument can be made to consider other indices, such as the Gross Domestic Product (GDP) deflator, to make inflation adjustments. CPI is selected simply because the previous studies cited in Chapter 2 used CPI. This symmetry allows more direct comparison of inflation-adjusted values from this thesis and past studies if that is warranted. Inflation-adjusted values and percentages are adjusted to 2008 U.S. Dollars using the CPI index. The formula for converting values and percentages in year *n* to 2008 U.S. Dollars is as follows:

Year *n* Nominal Datum X (1+(2008 CPI Value – Year *n* CPI Value) / Year *n* CPI Value) For example, the ending 1977 value of the Allerton Farms expressed in 2008 U.S. Dollars is calculated as follows: Ending 1977 value of $10,031,472 × (1+(2008 CPI Value of 210.2 - 1977 CPI Value of 62.1) / 1977 CPI Value of 62.1) = $33,959,684

The land value percentage changes for nominal values and real values are expected to be identical if both the numerator and denominator have been adjusted by the same CPI index value to convert nominal to real. However, a real beginning-of-year farm value is not calculated using the same CPI value as the end-of-year farm value for that year. The real beginning-of-year farm value uses the prior year CPI value to adjust the nominal beginning-of-year farm value, and thus, is equal to the prior year's real end-of-year value. This makes intuitive sense, and the difference between the nominal and real land value percentage changes each year is approximately the CPI change for that year.

Ibbotson's 2009 Valuation Yearbook is the source for investment performance histories for the other asset classes to which the UI farmland portfolio is compared.

Due to the similar indexing process for valuing each farm, the correlations of the percentage change in individual farm valuation and total returns with their corresponding values for the total portfolio are fairly meaningless.

A soil profile is provided for each farm in its corresponding section below. 1st Farm Credit Services assigns a higher value to farms with comparatively greater soil Productivity Index (PI) total values due to the tendency of high PI farms to produce relatively higher current incomes. A farm's overall PI is a weighted average of the productive capacity values of each soil type found on the farm, with corresponding values assigned to each individual soil type

based on its moisture and fertility supplying properties. Weights are assigned based on the amount of acreage of each soil type on that farm. Drainage improvements and other enhancements to a farm's fertility may also have an effect on total value.

The financial performance of individual farms and the total UI farmland portfolio starts below with the Allerton Farms. Detailed farm performance is shown in Appendix A.

Allerton Farms

The Allerton farms in Piatt County, Illinois, were received by the UI in 1946 through an indenture between donor Robert Allerton and the UI. The weighted average PI is 139 for the approximately 3,884 acres of farmland. The most prominent soil types on the farm are Ipava silt loam and Sable silty clay loam. Class A soils make up 2,933 acres, Class B soils make up 331 acres and the remainder is in Class C soils, forest and pasture.

The Allerton farms were crop-share leased until the 2006 crop year. APS determined market cash rents in the fall of 2005 for all four farm units and offered these to the respective farm operators for the upcoming crop year. Negotiations were successful with three farm operators. The fourth farm unit was competitively bid and eventually awarded to a lessee of one of the other Allerton units. The other three farm units were competitively bid prior to 2008.

For the 47-year period of 1962-2008, the Allerton farms produced an average cash return of 4.2% and an average total return of 9.4%. Inflation averaged 4.2% over the same period. Adjusted for inflation, the cash return was 4.0% and the total return was 4.9%. The mean real net income per tillable acre was $207, with standard deviation of $70. The minimum and maximum real net incomes per tillable acre were $78 and $453, respectively.

The following figures illustrate the Allerton farms' financial performance for the period of 1962-2008. Additional data and figures for the Allerton farms can be reviewed in Appendix A. Figure 3.2 illustrates nominal and real net income per tillable acre.

Figure 3.2. Allerton Farms Nominal and Real Net Income per Tillable Acre.

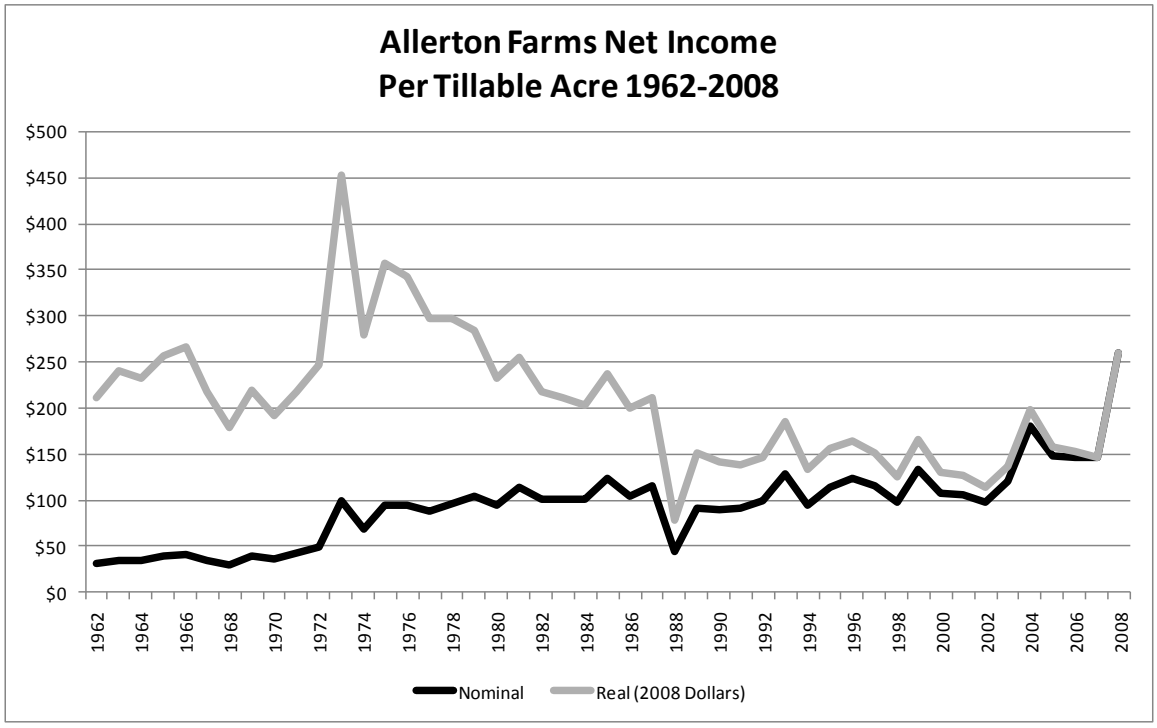
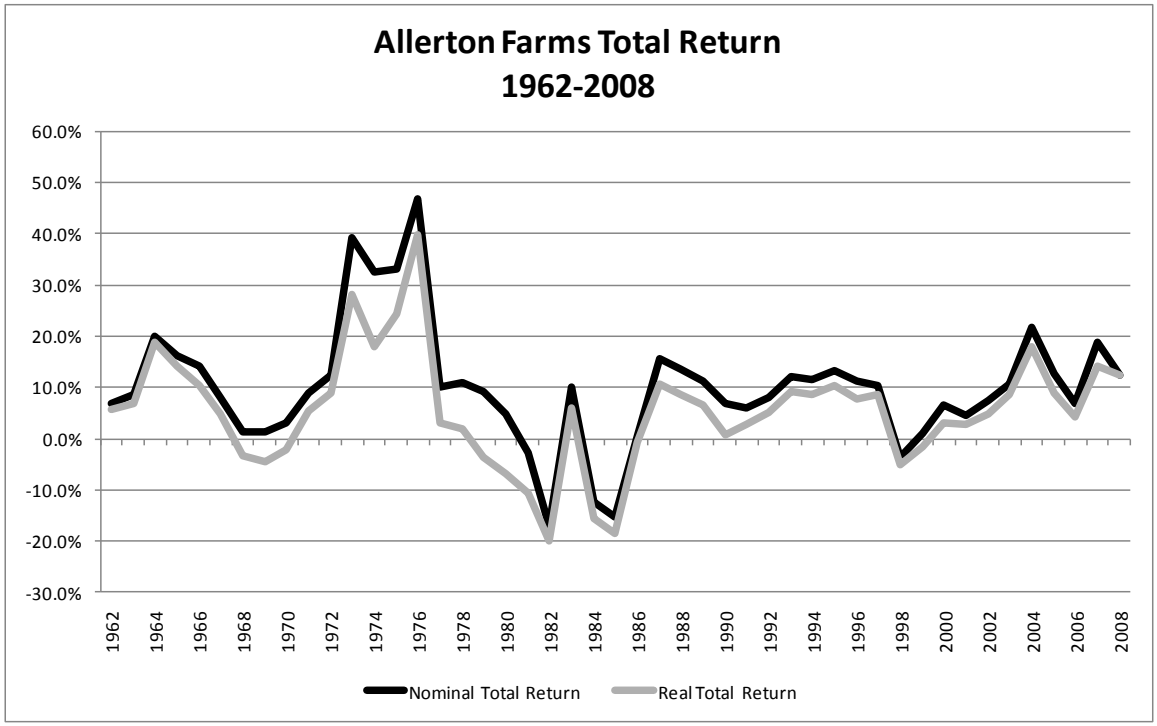


Figure 3.3. Allerton Farms Nominal and Real Total Return.



Campbell Farm

The Campbell endowment farm in DeWitt County, Illinois, was received by the UI in 1976 from the estate of Grace V. Campbell. The PI is 137 for this approximately 85.2 acre farm. The most prominent soil types on the farm are Sable silty clay loam, Catlin silt loam and Buckhart silt loam. Class A soils make up 55 acres and Class B soils make up 30 acres.

Reported tillable and total acreage data for the Campbell farm has become more accurate in recent years through the use of Global Positioning System (GPS) technology. GPS indicates there are 85.2 acres, but the DeWitt County plat book continues to report the farm as 80 total acres.

The Campbell farm was crop-share leased until the 2008 crop year. The farm was competitively bid in the fall of 2007 for the upcoming crop year.

For the 32- year period of 1977-2008, the Campbell farm produced an average cash return of 4.1% and an average total return of 6.3%. Inflation averaged 4.1% over the same period. Adjusted for inflation, the cash return was 3.9% and the total return was 2.1%. The mean real net income per tillable acre was $167 with standard deviation of $62. The minimum and maximum real net incomes per tillable acre were $82 and $308, respectively.

The following figures illustrate the Campbell farm's financial performance for the period of 1977-2008. Additional data and figures for the Campbell farm can be reviewed in Appendix A.

Figure 3.4. Campbell Farm Nominal and Real Net Income per Tillable Acre.

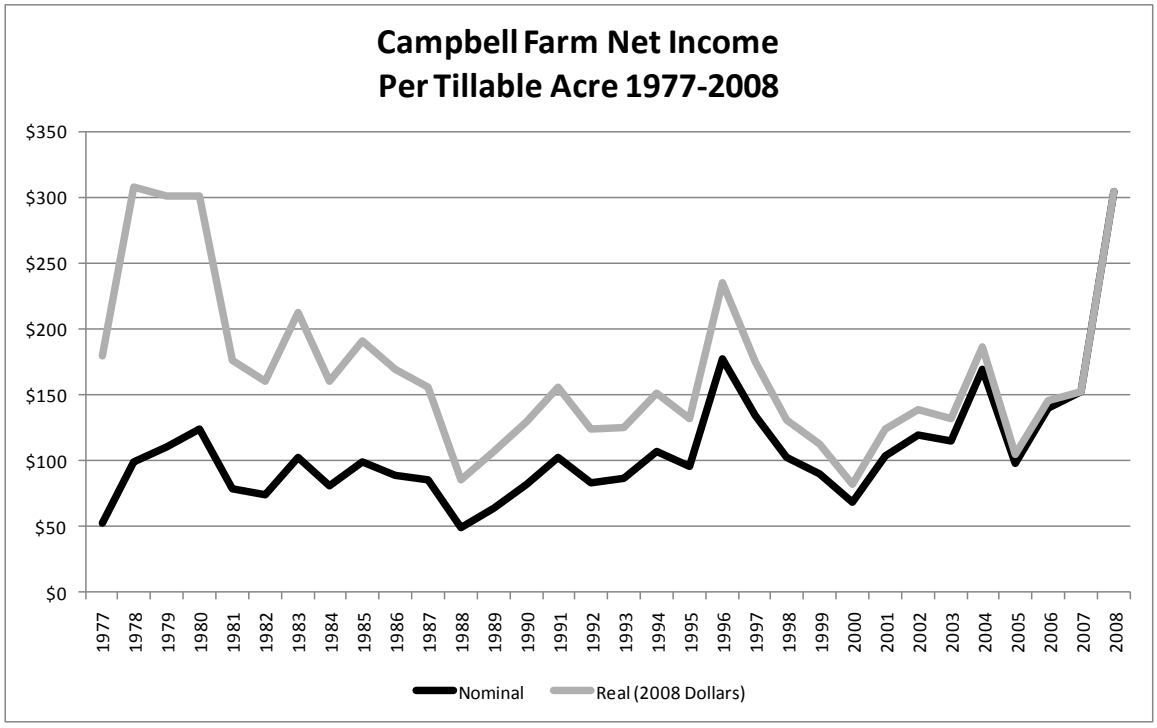
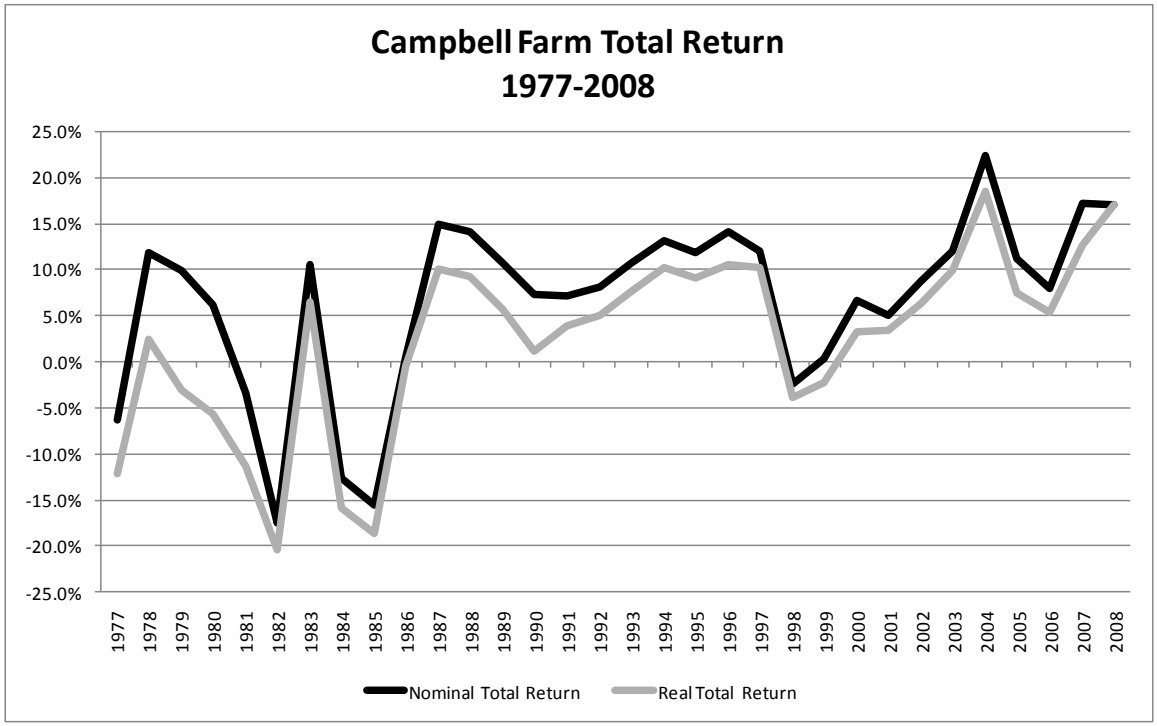


Figure 3.5. Campbell Farm Nominal and Real Total Return.



Carter-Pennell Farm

The Carter-Pennell farm in Vermilion County, Illinois, was the first endowment farm given to the UI in 1923. It was operated for decades as a cattle and grain farm. The UI and the farm operator shared in the cattle revenue and expenses. The SPI is 114 for this approximately 346- acre farm. The most prominent soil types on the farm are Rowe silty clay, Clarence silty clay loam and Swygert silty clay loam. There are no Class A soils on the Carter-Pennell farm. Class B soils make up 29 acres and Class C soils make up 187 acres. The small remaining acreage is in Class D soils, waterways and roadsides.

The Carter-Pennell farm was crop-share leased until the 2005 crop year. The farm was competitively bid in the winter of 2004-05 for the upcoming crop year.

For the 47-year period of 1962-2008, the Carter-Pennell farm produced an average cash return of 5.6% and an average total return of 11.4%. Inflation averaged 4.2% over the same period. Adjusted for inflation, the cash return was 5.3% and the total return was 6.9%. The mean real net income per tillable acre was $139, with standard deviation of $81. The minimum and maximum real net incomes per tillable acre were $21 and $402, respectively.

The following figures illustrate the Carter-Pennell farm's financial performance for the period 1962-2008. Additional data and figures for the Carter-Pennell farm can be reviewed in Appendix A.

Figure 3.6. Carter-Pennell Farm Nominal and Real Net Income per Tillable Acre.

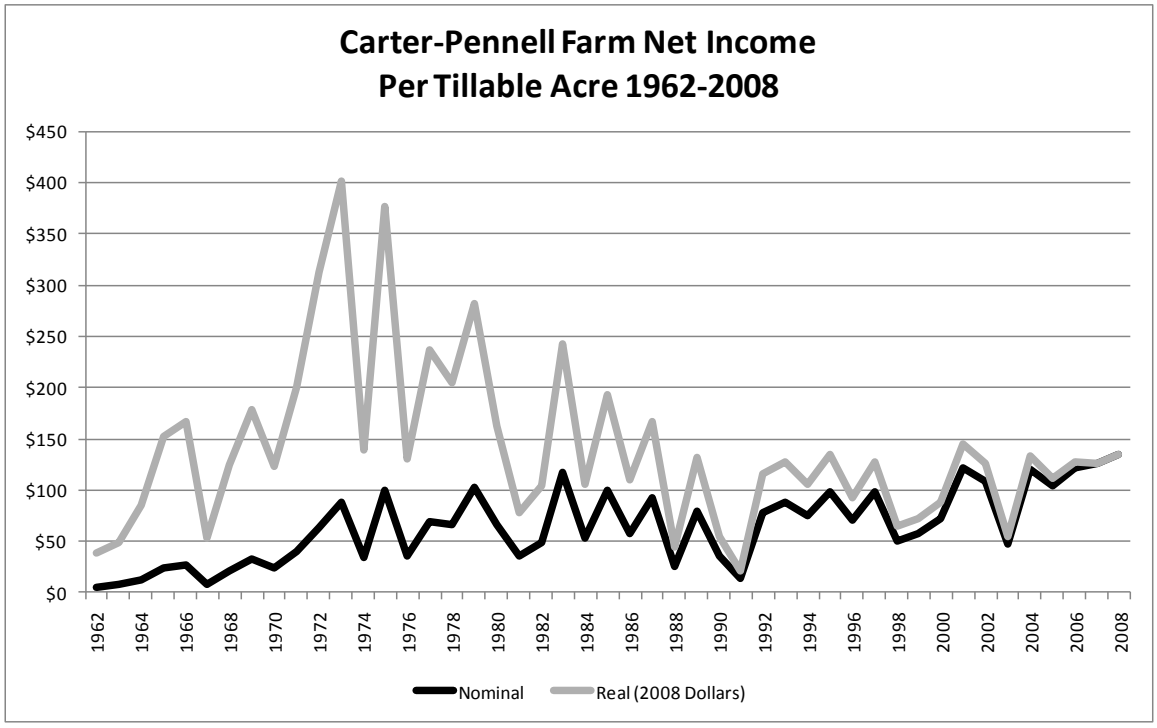
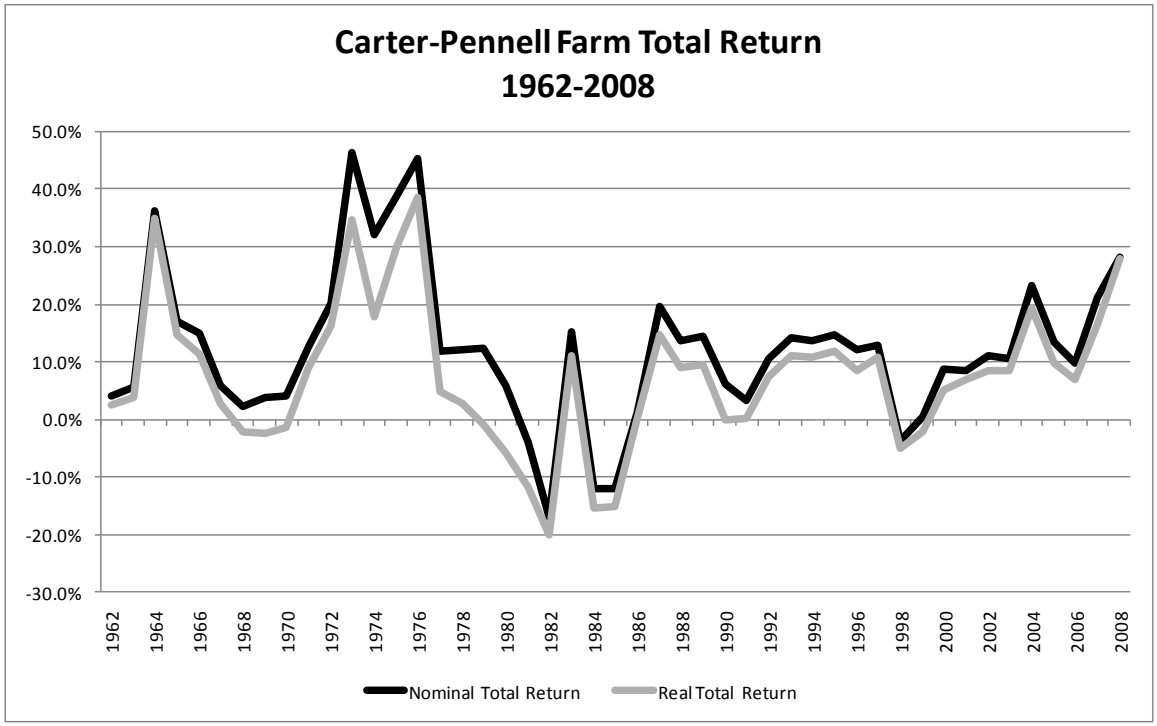


Figure 3.7. Carter-Pennell Farm Nominal and Real Total Return.



DeHart Farm

The DeHart endowment farm in Moultrie County, Illinois, was received by the UI in 1975 from the estate of Carl A. DeHart. The SPI is 138 for this approximately 120-acre farm. The most prominent soil types on the farm are Drummer-Milford silty clay loam and Flanagan silt loam. Class A soils make up 107 acres and Class B soils make up 9 acres.

The DeHart farm was competitively bid in the fall of 2005 for the upcoming crop year. The farm was crop-share leased until the 2006 crop year.

For the 33-year period of 1976-2008, the DeHart farm produced an average cash return of 3.9% and an average total return of 7.4%. Inflation averaged 4.1% over the same period. Adjusted for inflation, the cash return was 3.7% and the total return was 3.1%. The mean real net income per tillable acre was $177 with standard deviation of $79. The minimum and maximum real net incomes per tillable acre were $69 and $453, respectively.

The following figures illustrate the DeHart farm's financial performance for the period of 1976-2008. Additional data and figures for the DeHart farm can be reviewed in Appendix A.

Figure 3.8. DeHart Farm Nominal and Real Net Income per Tillable Acre.

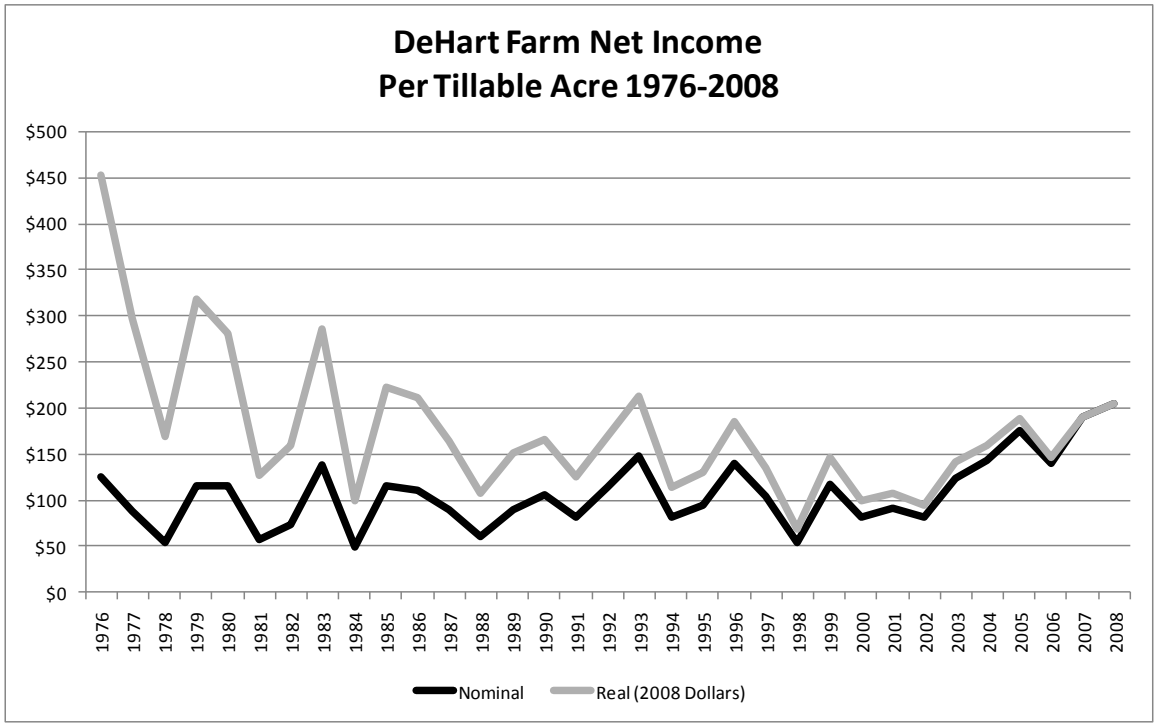
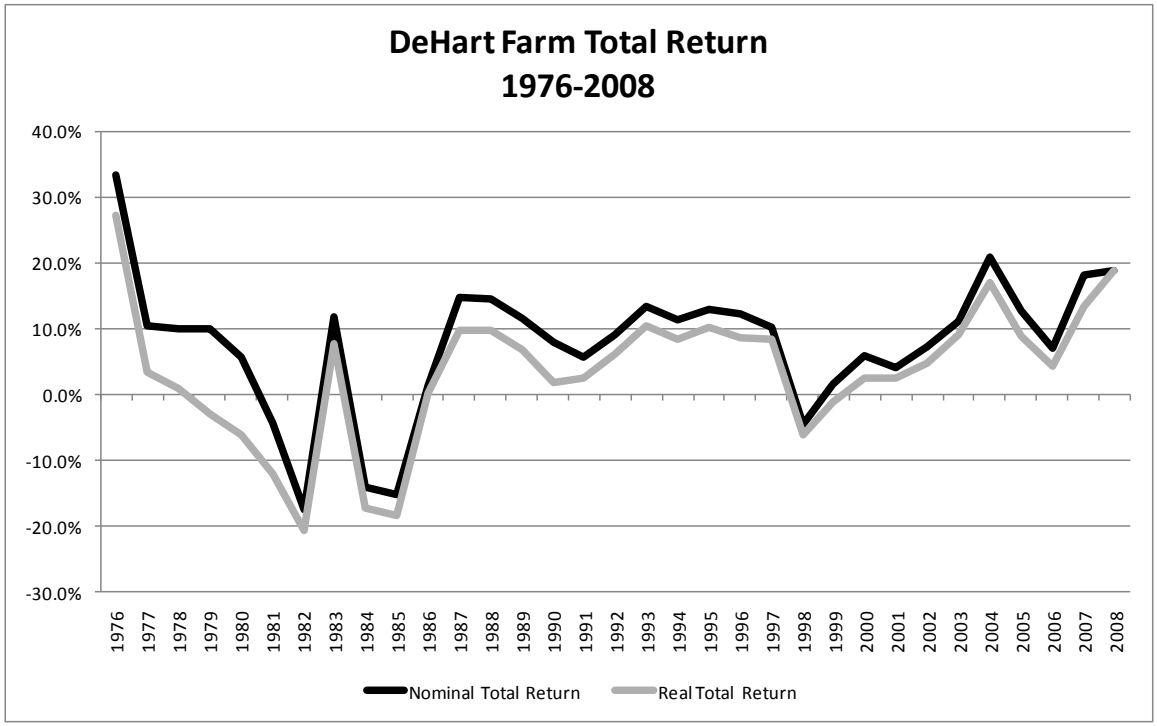


Figure 3.9. DeHart Farm Nominal and Real Total Return.



Hackett Farm

The Hackett endowment farm in Douglas County, Illinois, was received by the UI in 1950 from the estate of Jessie E. Hackett. The SPI is 135 for this approximately 416 acre farm. The most prominent soil types on the farm are Drummer-Milford silty clay loam, Flanagan silt loam, Sunbury silt loam and Sabina silt loam. Class A soils make up 266 acres and Class B soils make up 92 acres. The remaining acreage consists of Class C soils, woodland, pasture and roadsides.

The Hackett farm was competitively bid in the fall of 2005 for the upcoming crop year. The farm was crop-share leased until the 2006 crop year.

For the 39-year period of 1970-2008, the Hackett farm produced an average cash return of 3.6% and an average total return of 8.9%. Inflation averaged 4.5% over the same period. Adjusted for inflation, the cash return was 3.5% and the total return was 4.2%. The mean real net income per tillable acre was $174 with standard deviation of $70. The minimum and maximum real net incomes per tillable acre were $49 and $365, respectively.

The following figures illustrate the Hackett farm's financial performance for the period of 1970-2008. Additional data and figures for the Hackett farm can be reviewed in Appendix A.

Figure 3.10. Hackett Farm Nominal and Real Net Income per Tillable Acre.

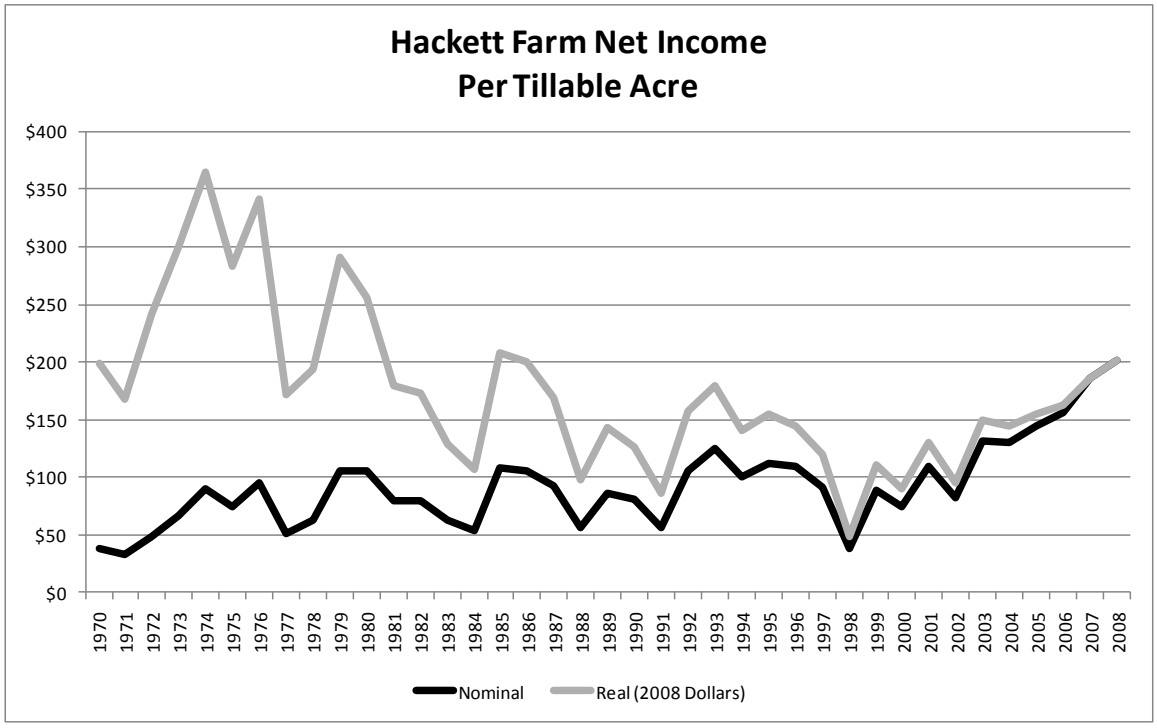
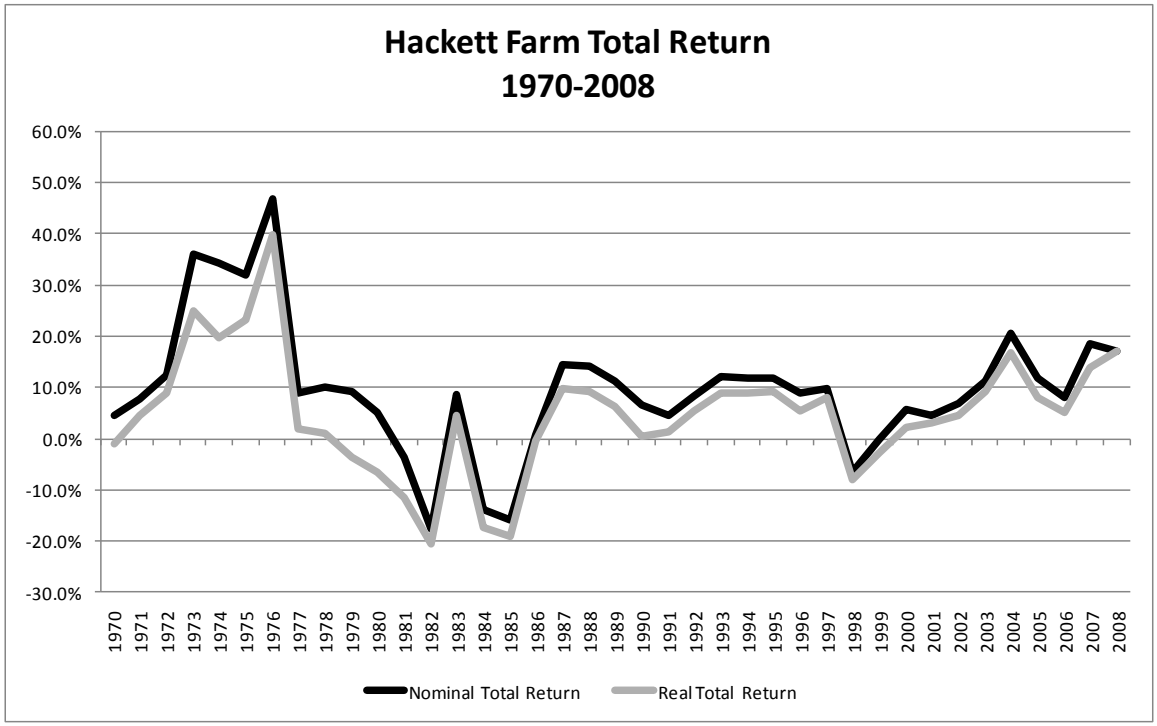


Figure 3.11. Hackett Farm Nominal and Real Total Return.



Hubbell Farm

The Hubbell endowment farm in DeWitt County, Illinois, was received by the UI in 1972 from the estate of Alta E. Teter. The SPI is 126 for this approximately 160 acre farm. The most prominent soil types on the farm are Sable silty clay loam, Catlin silt loam and Ipava silt loam. Class A soils make up 92 acres and Class B soils make up 61 acres.

The Hubbell farm was crop-share leased until the 2005 crop year. The farm was competitively bid in the winter of 2004-05 for the upcoming crop year.

For the 32-year period of 1977-2008, the Hubbell farm produced an average cash return of 4.3% and an average total return of 9.7%. Inflation averaged 4.5% over the same period. Adjusted for inflation, the cash return was 4.1% and the total return was 5.0%. The mean real net income per tillable acre was $186, with standard deviation of $95. The minimum and maximum real net incomes per tillable acre were $80 and $477, respectively.

The following figures illustrate the Hubbell farm's financial performance for the period of 1973-2008. Additional data and figures for the Hubbell farm can be reviewed in Appendix A.

Figure 3.12. Hubbell Farm Nominal and Real Net Income per Tillable Acre.

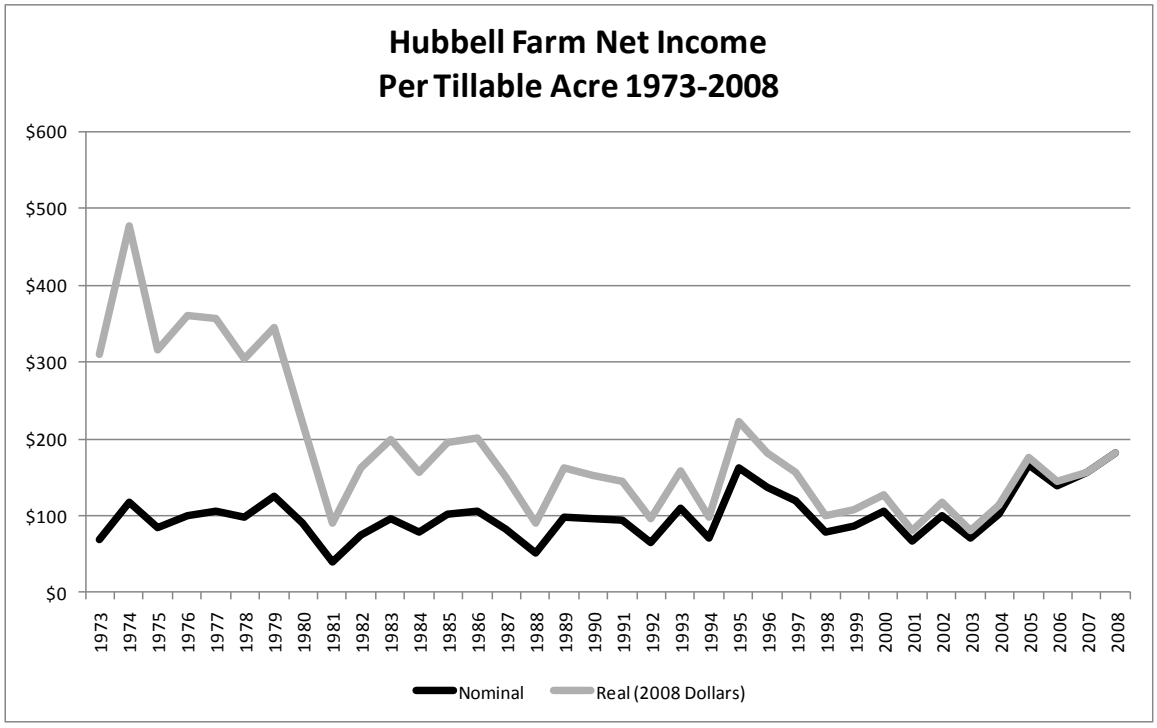
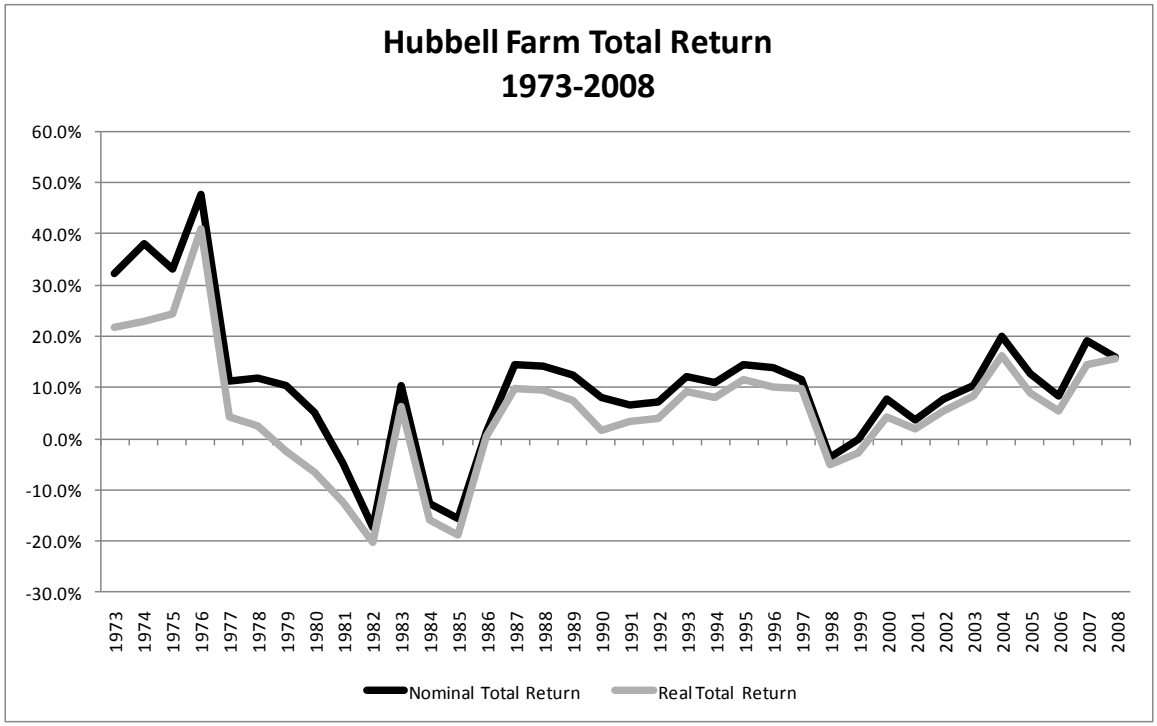


Figure 3.13. Hubbell Farm Nominal and Real Total Return.



Hunter Research Farm

The Hunter endowment farm for research in Champaign County, Illinois, was received by the UI in 1975 from the estate of Ralph O. and Mabel F. Hunter. The SPI is 142 for this approximately 280-acre farm. The most prominent soil types on the farm are Flanagan silt loam and Drummer silty clay loam. Class A soils make up 218 acres, Class B soils make up 8 acres and Class C soils make up 16 acres. The remaining acreage is in pasture and roadsides.

The Hunter Research farm was competitively bid in the fall of 2007 for the upcoming crop year. The farm was crop-share leased until the 2008 crop year.

For the 33-year period of 1976-2008, the Hunter Research farm produced an average cash return of 3.3% and an average total return of 6.0%. Inflation averaged 4.1% over the same period. Adjusted for inflation, the cash return was 3.2% and the total return was 1.8%. The mean real net income per tillable acre was $168, with standard deviation of $83. The minimum and maximum real net incomes per tillable acre were $26 and $377, respectively.

The following figures illustrate the Hunter Research farm's financial performance for the period of 1976-2008. Additional data and figures for the Hunter Research farm can be reviewed in Appendix A.

Figure 3.14. Hunter Research Farm Nominal and Real Net Income per Tillable Acre.

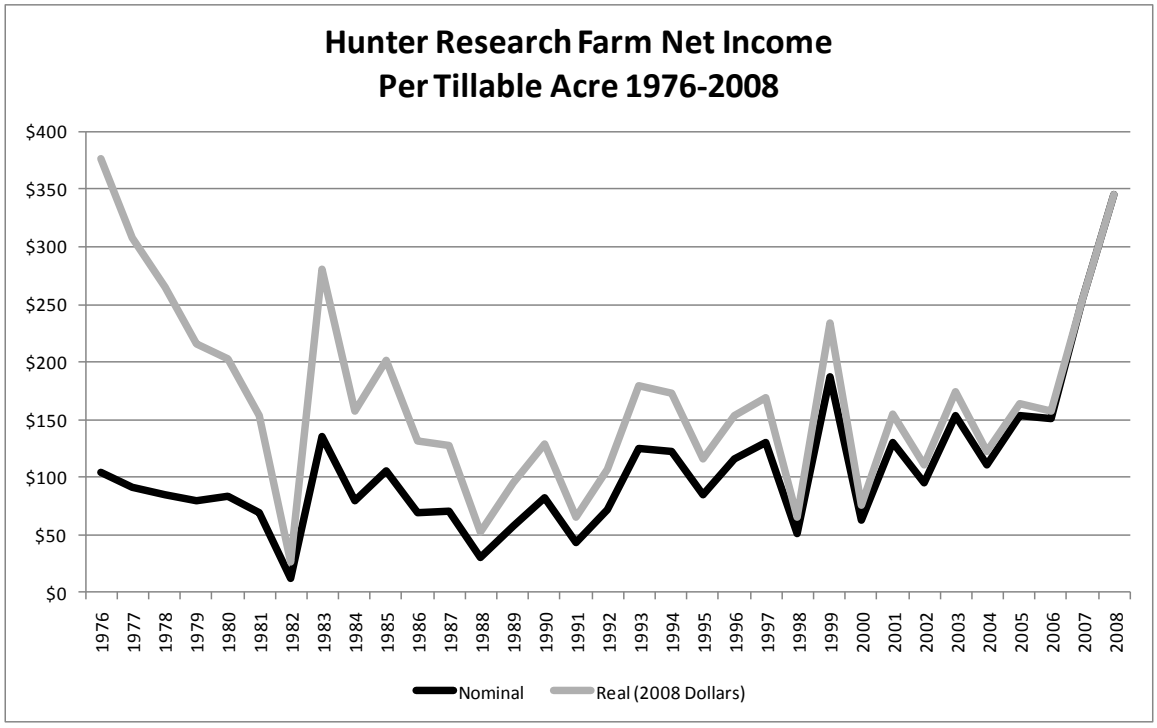
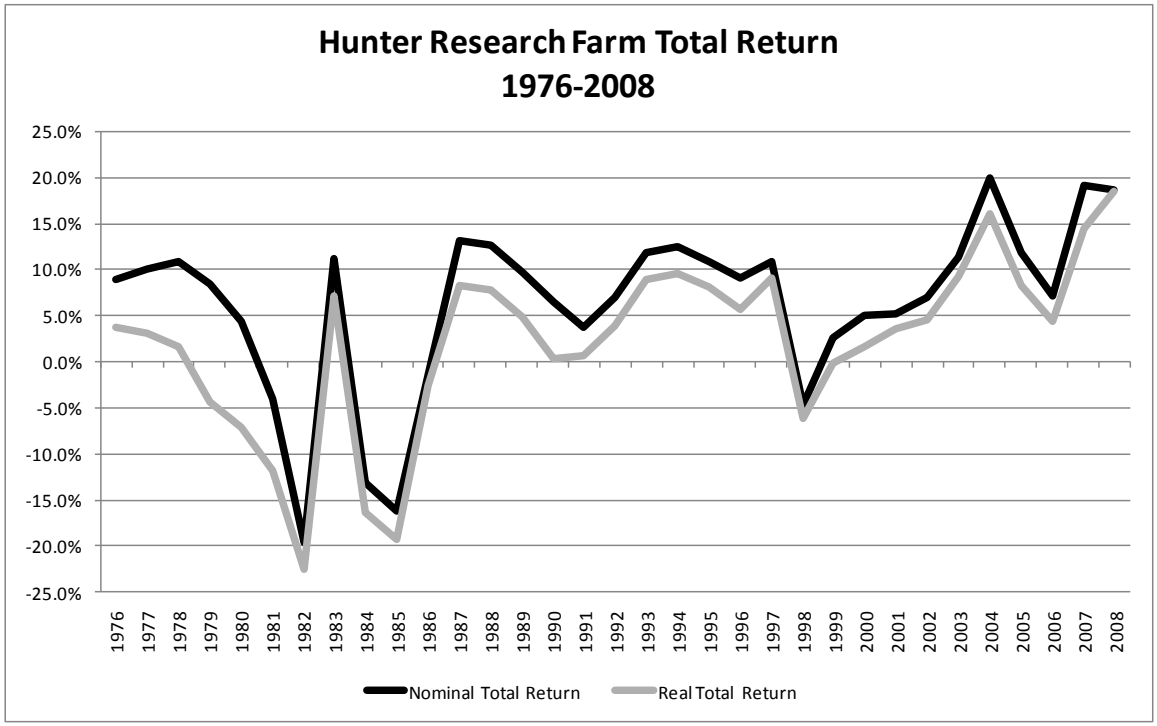


Figure 3.15. Hunter Research Farm Nominal and Real Total Return.



Hunter Scholarship Farms

The Hunter endowment farms for scholarships in Menard, Macoupin and Sangamon Counties, Illinois, were received by the UI in 1975 from the estate of Ralph O. and Mabel F. Hunter. The SPI is 138 for these five farm units that total approximately 1,256 acres. The most prominent soil types on the farms are Ipava silt loam, Osco silt loam and Virden silty clay loam. Class A soils make up 946 acres, Class B soils make up 117 acres and Class C soils make up 94 acres. Pasture, waterways and roadsides make up the remaining acreage.

Three of the Hunter Scholarship farm units were competitively bid in the fall of 2007 for the upcoming crop year. The farms were crop-share leased until the 2008 crop year. One farm unit remains under modified crop-share lease due to ongoing faculty research that can potentially affect crop yields.

For the 33-year period of 1976-2008, the Hunter Scholarship farms produced an average cash return of 3.3% and an average total return of 7.3%. Inflation averaged 4.1% over the same period. Adjusted for inflation, the cash return was 3.2% and the total return was 3.1%.

The mean real net income per tillable acre was $173, with standard deviation of $65. The minimum and maximum real net incomes per tillable acre were $22 and $336, respectively.

The following figures illustrate the Hunter Scholarship farms' financial performance for the period of 1976-2008. Additional data and figures for the Hunter Scholarship farms can be reviewed in Appendix A.

Figure 3.16. Hunter Scholarship Farms Nominal and Real Net Income per Tillable Acre.

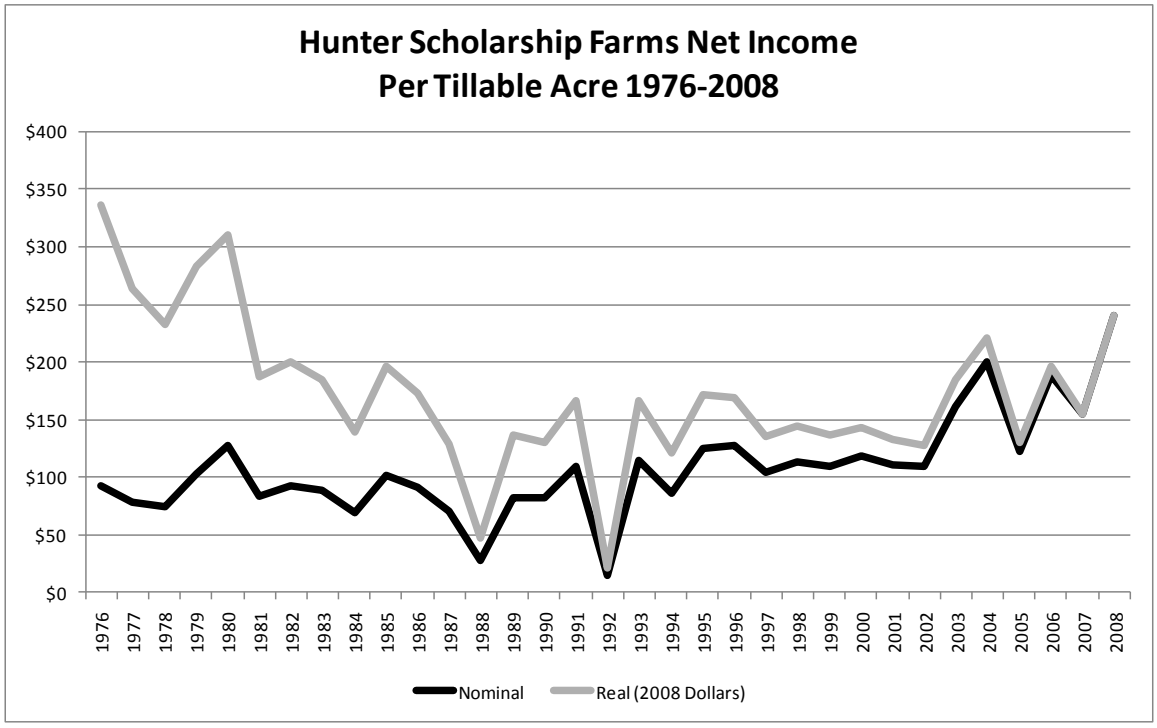
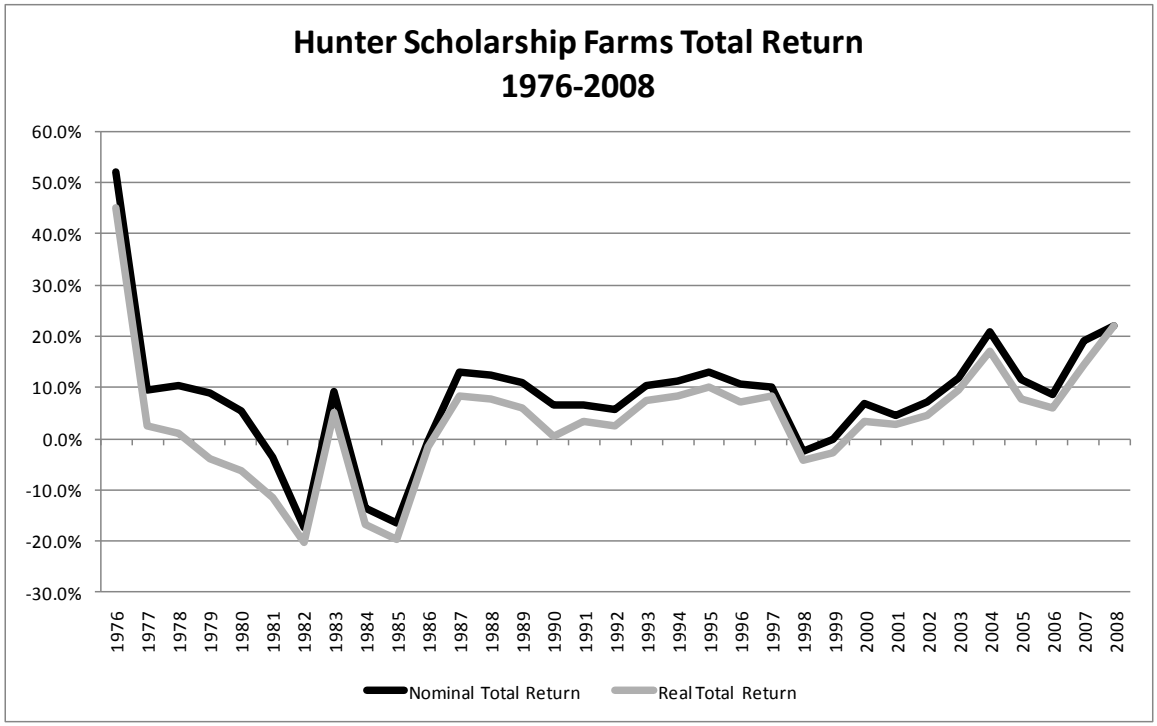


Figure 3.17. Hunter Scholarship Farms Nominal and Real Total Return.



Warren Farm

The Warren endowment farm in Piatt County, Illinois,was received by the UI in 1955 from the estate of Elizabeth H. Warren. The SPI is 141 for this approximately 120- acre farm. The initial gift of 40 acres was received by the UI in 1955, and the remaining 80 acres were received in 1996 after the death of a life beneficiary. The most prominent soil types on the farm are Sable silty clay loam and Ipava silt loam. Class A soils make up 118 acres, and roadsides make up the remaining acres.

The Warren farm has been under a crop-share lease arrangement since the UI received the first 40 acres. The current farm operator is a relative of Mrs. Warren and thus, the Warren farm is exempt from competitive bidding out of respect for the donor relationship.

For the 39-year period of 1970-2008, the Warren farm produced an average cash return of 4.6% and an average total return of 9.7%. Inflation averaged 4.5% over the same period. Adjusted for inflation, the cash return was 4.4% and the total return was 5.0%. The mean real net income per tillable acre was $208 with standard deviation of $101. The minimum and maximum real net incomes per tillable acre were $25 and $499, respectively.

The following figures illustrate the Warren farm's financial performance for the period 1970-2008. Additional data and figures for the Warren farm can be reviewed in Appendix A.

Figure 3.18. Warren Farm Nominal and Real Net Income per Tillable Acre.

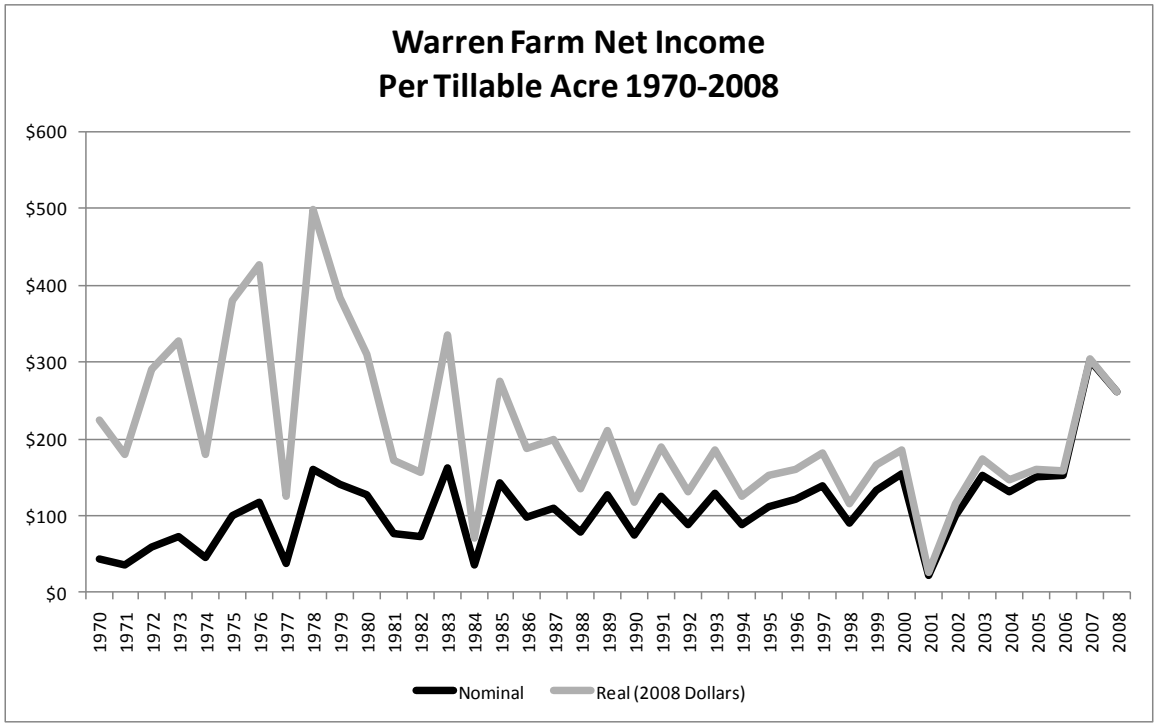
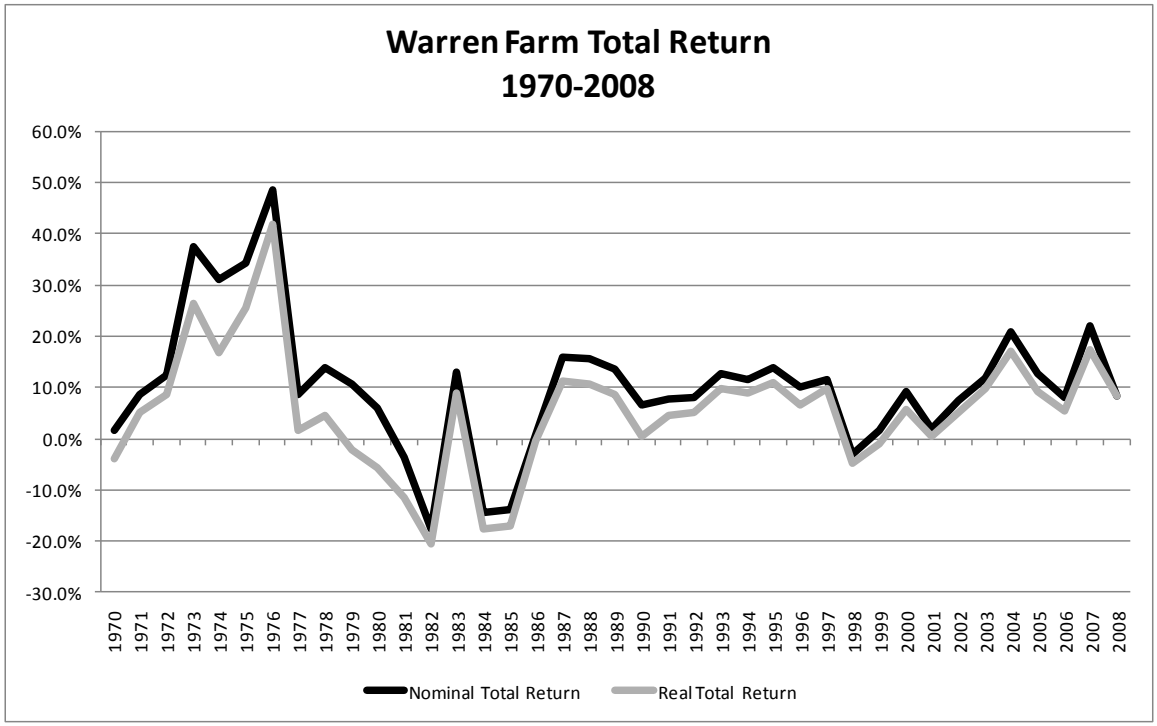


Figure 3.19. Warren Farm Nominal and Real Total Return.



Weber Farm

The Weber endowment farm in LaSalle County, Illinois, was received by the UI in 1955 from the estate of Laura M. Weber. The SPI is 140 for this approximately 800- acre farm. The most prominent soil types on the farm are Catlin silt loam, Elpaso silty clay loam and Flanagan-Catlin silt loams. Class A soils make up 645 acres and Class B soils make up 116 acres. The remaining acreage consists of waterways and roadsides.

The Weber farm was competitively bid in the fall of 2007 for the upcoming crop year. The farm was crop-share leased until the 2008 crop year.

For the 39-year period of 1970-2008, the Weber farm produced an average cash return of 3.7% and an average total return of 9.3%. Inflation averaged 4.5% over the same period. Adjusted for inflation, the cash return was 3.5% and the total return was 4.6%. The mean real net income per tillable acre was $184, with standard deviation of $99. The minimum and maximum real net incomes per tillable acre were $13 and $449, respectively.

The following figures illustrate the Weber farm's financial performance for the period of 1970-2008. Additional data and figures for the Weber farm can be reviewed in Appendix A.

Figure 3.20. Weber Farms Nominal and Real Net Income per Tillable Acre.

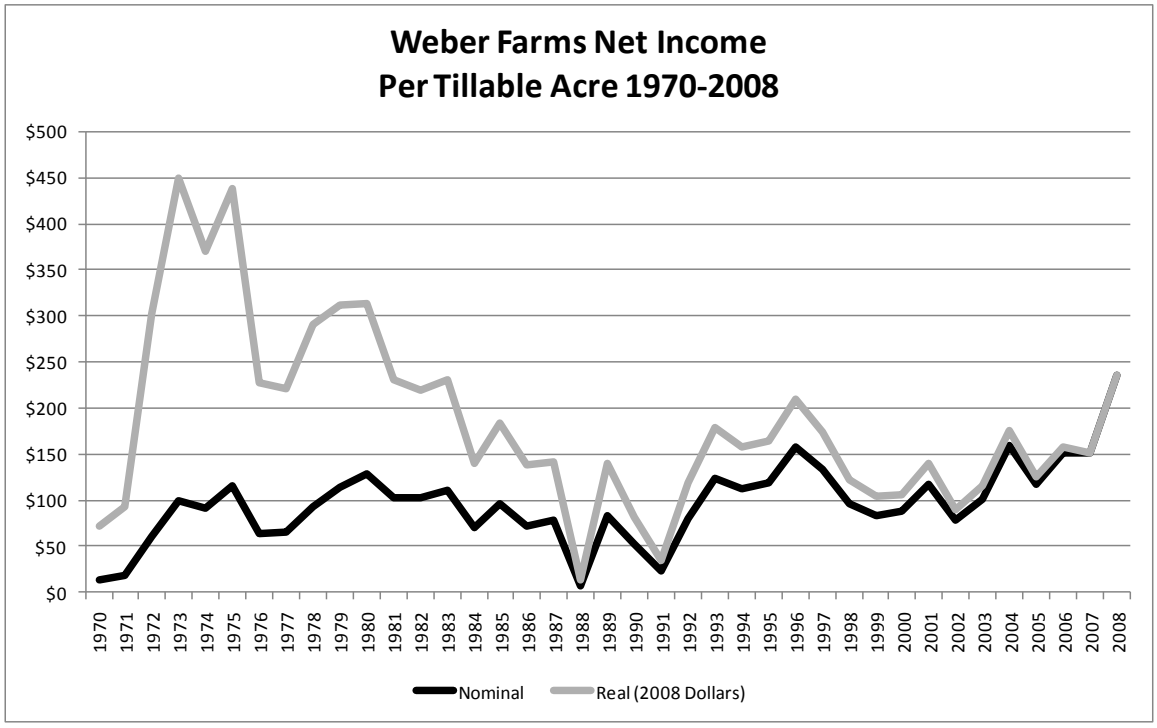
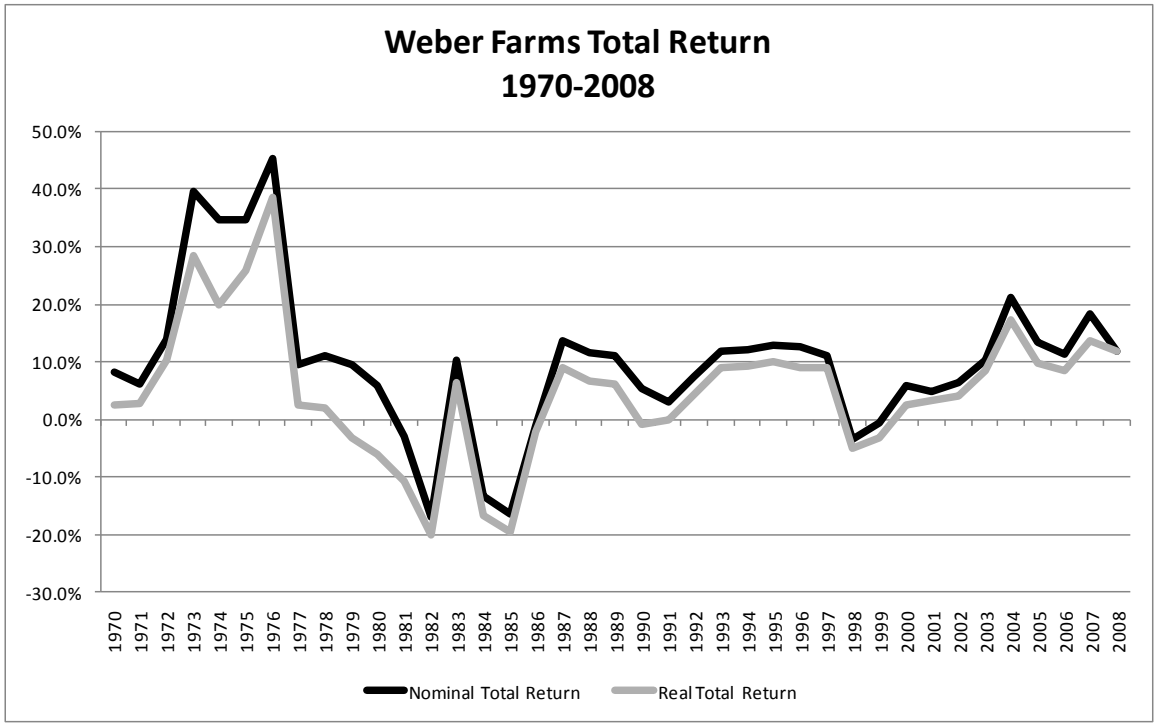


Figure 3.21. Weber Farms Nominal and Real Total Return.



Wright Farm

The Wright endowment farm in DeKalb County, Illinois, was received by the UI in 1943 from the estate of Harry G. Wright. The SPI is 138 for this approximately 893- acre farm. The most prominent soil types on the farm are Catlin silt loam, Flanagan silt loam, Drummer silty clay loam and Saybrook silt loam. Class A soils make up 625 acres and Class B soils make up 225 acres. The remaining acreage is in a small amount of Class C soils, building sites, drainage and roadsides.

The Wright farm was crop-share leased through the 2005 crop year. The farm was competitively bid in the winter of 2005-06 for the upcoming crop year. The Wright farm was sold at auction in June, 2007, for $8,045,000.

For the 38-year period 1970-2007, the Wright farm produced an average cash return of 2.4% and an average total return of 8.5%. Inflation averaged 4.6% over the same period. Adjusted for inflation, the cash return was 2.3% and the total return was 3.7%. The mean real net income per tillable acre was $166, with standard deviation of $91. The minimum and maximum real net incomes per tillable acre were $17 and $470, respectively. Development pressures extending from Chicago and its surrounding counties influenced farmland values as far away as the Wright farm.

The following figures illustrate the Wright farm's financial performance for the period 1970-2007. Additional data and figures for the Wright farms can be reviewed in Appendix A.

Figure 3.22. Wright Farms Nominal and Real Net Income per Tillable Acre.

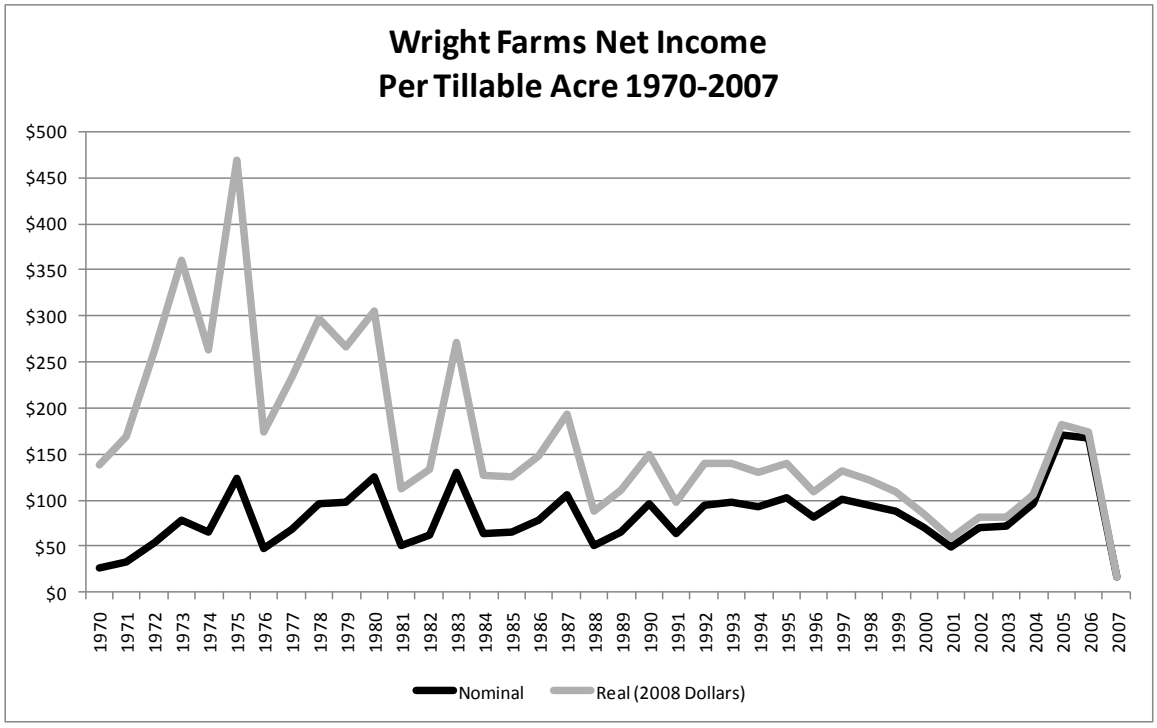
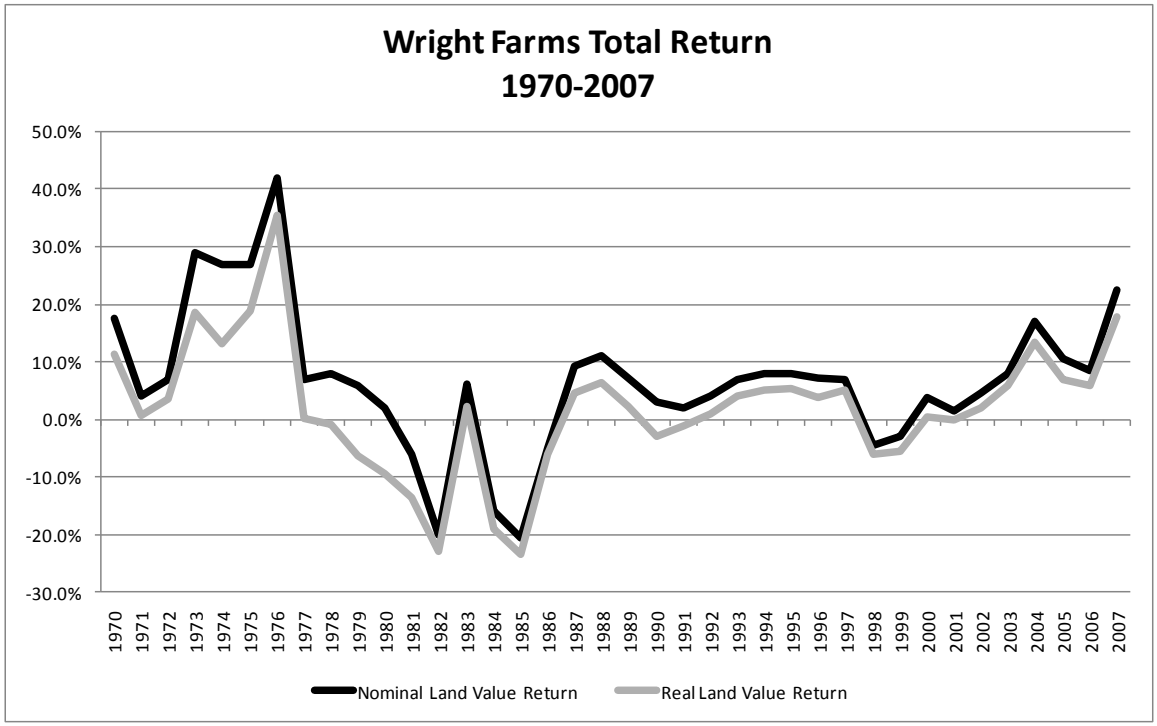


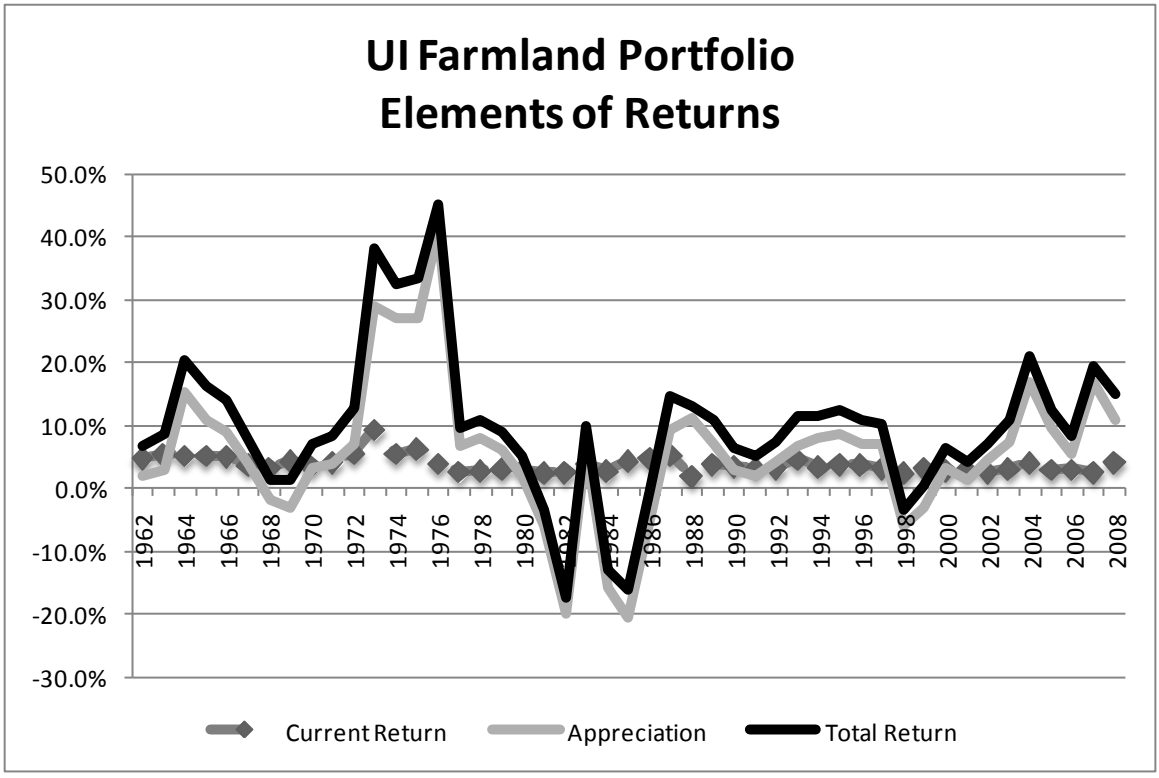
Figure 3.23. Wright Farms Nominal and Real Total Return.



Total Farm Portfolio

For the 47-year period 1962-2008, the total farm portfolio produced an average cash return of 3.9% and an average total return of 9.3%. Inflation averaged 4.2% over the same period. Adjusted for inflation, the cash return was 3.8% and the total return was 4.8%. Figure 3.24 illustrates the elements that make up farmland returns for the 1962-2008 period. Appreciation in farmland value is the driver behind total return, as Figure 3.24 clearly shows.

Figure 3.24. Elements of UI Farmland Portfolio Returns.



The mean real net income per tillable acre was $195, with standard deviation of $70. The minimum and maximum real net incomes per tillable acre were $68 and $422, respectively.

The following figures illustrate the financial performance of the Total Farm Portfolio for the period of 1962-2008. Additional data and figures for the Total UI Farm Portfolio can be reviewed in Appendix A.

Figure 3.25. Total Farm Portfolio Nominal and Real Net Income per Tillable Acre.

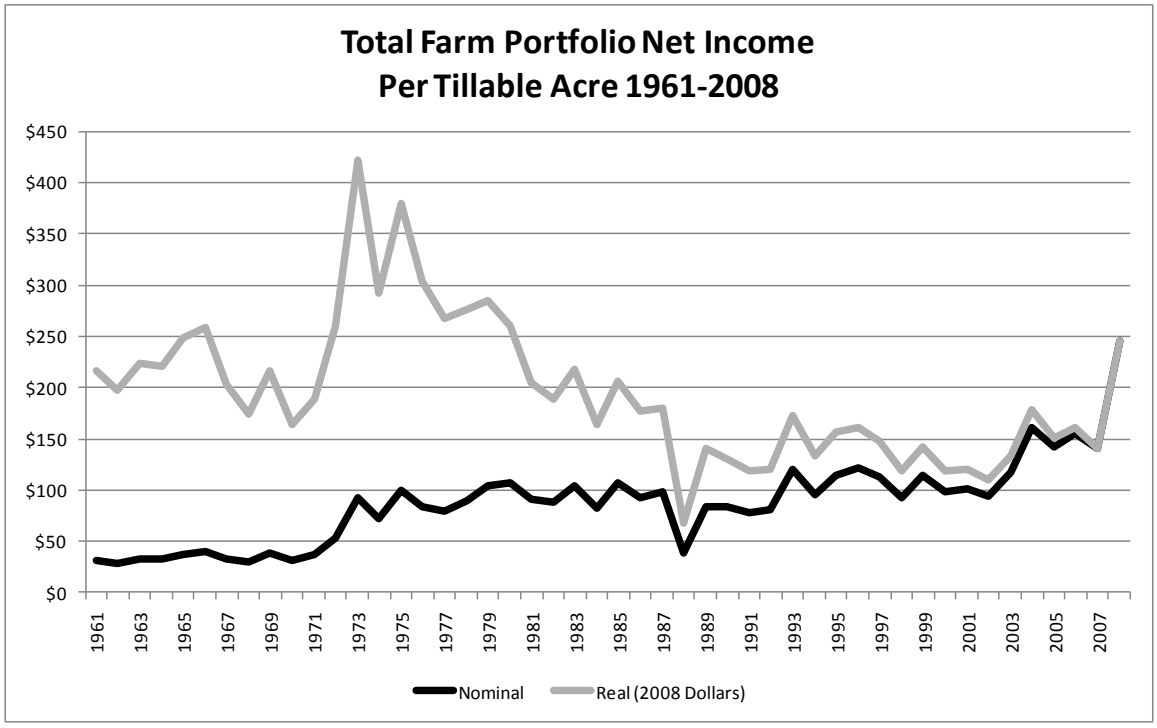
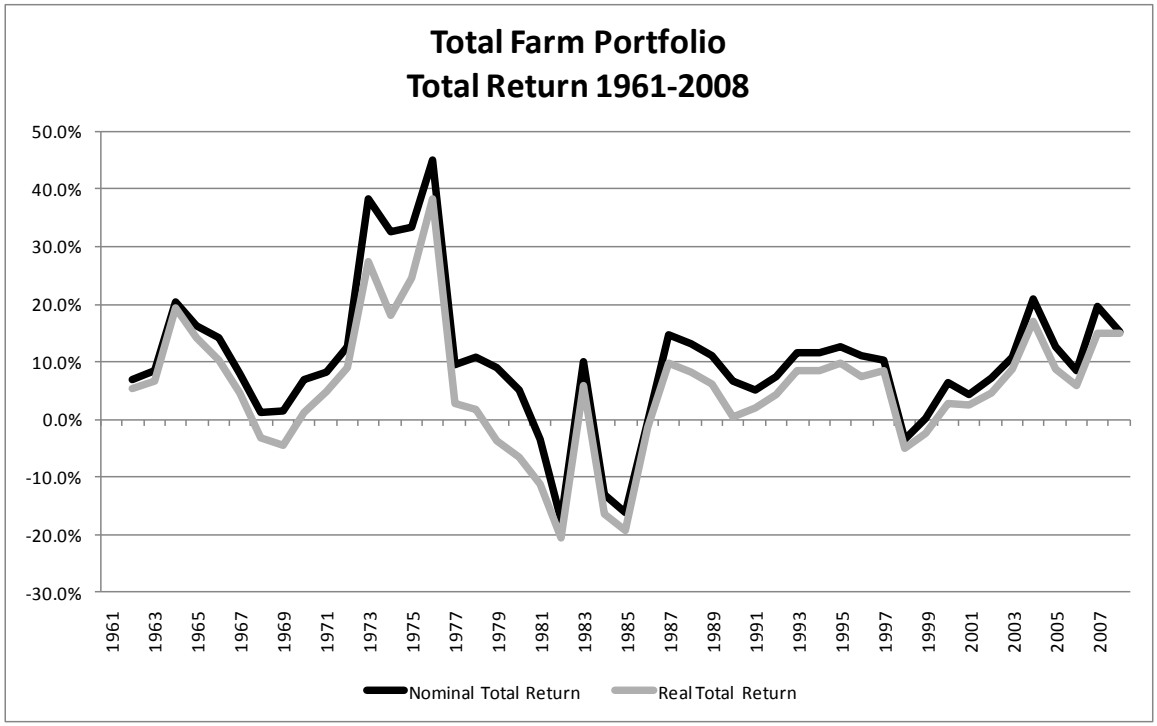


Figure 3.26. Total Farm Portfolio Nominal and Real Total Return.



CHAPTER 4

METHODS

Introduction

The following sections provide a summary of the processes used to analyze the critical questions identified in Chapter 1. What has been the historical financial performance of the UI Farmland Portfolio? How do the UI farmland portfolio returns correlate with the returns of other major asset classes? Do investments in farmland have intrinsic value as an inflation hedge? How do the results in this analysis compare with other predictive models from the past that have used aggregate data from different periods and/or widely dispersed geographic areas? The methods and tools used to explore these questions are described below.

Statistical Analysis

All calculations and statistical analyses are conducted in Microsoft Excel. Annual farm revenues and expenses in the Agricultural Property Services (APS) office database were rechecked for accuracy for each farm and annual net income calculated. Farm valuations follow the process described in Chapter 3. Geometric returns are calculated for cash return, land value return and total return for each farm for the following periods and sub-periods:

1. 1962-2008 – This is the period for which University Accounting and Financial Reporting (UAFR) and APS files contained complete farm income data.
2. 1962-1970 – A period of high cash returns and moderate increases in land values.
3. 1971-1980 – A decade of high cash returns and large increases in land values.
4. 1981-1990 – A decade of moderate cash returns with large increases in land values early in the period, followed by a severe correction in land values.

5. 1991-2000 – This decade produced moderate levels of cash returns and land value returns.
6. 2001-2008 – A period of moderate cash returns and large increases in land values.
7. 1962-1986 – This sub-period captures the large increases in land values, followed by the severe correction.
8. 1987-2008 – This sub-period includes the current upward trend in cash returns and land values.
9. 1962-2002 – This sub-period excludes the recent years of high net incomes and competitively bid cash rents. All leases in this period are crop share.
10. 1970-2008 – This sub-period starts the first year that USDA returns for Illinois farms are available.

Return data, net income and farm values are summarized for each farm. All references to returns for the total UI farm portfolio are *acre-weighted*. Thus, the larger farms have a relatively larger impact on return than do smaller farms. Other important statistical elements calculated for the total portfolio include geometric means, arithmetic means, minimums, maximums, standard deviations, coefficients of variation and skewness. The UI farm portfolio returns are compared to large company stocks, small company stocks, long-term corporate bonds, long-term government bonds, intermediate-term government bonds, U.S. Treasury bills and inflation. The Ibbotson SBBI 2009 Valuation Yearbook is the source for return data for these six asset classes. The UI farm portfolio is compared to USDA data for Illinois farms for the years 1970-2008. Correlation coefficients are calculated for the UI farm portfolio's cash return, land value return and total return versus the same return elements for each asset class stated above.

Optimal Portfolio Modeling

Constrained optimization using Microsoft Excel Solver can model optimal diversified portfolios for specific levels of risk. Markowitz portfolio theory is used to model an efficient portfolio of assets, which is a process of identifying portfolios that are on the "efficient frontier". The efficient frontier models the most efficient use of risk and the appropriate compensation investors should expect for accepting a given level of risk.[4] This is also known as the "E-V frontier" or the expected value-variance efficient frontier. Portfolios that lie on the E-V frontier have the highest return possible for their respective levels of risk, thus making the most efficient use of risk. Stated another way, portfolios on the E-V frontier have the lowest risk possible for their respective returns. Risk is measured in terms of the standard deviation and expected return of each asset class and the portfolio as a whole. Expected returns in this analysis are an arithmetic mean of the optimally-weighted *ex post* total returns for each asset class. The algebraic expression for total return is:

$$R_p = \sum_{g=1}^{G} w_g R_g$$

where R_p is the expected portfolio return, R_g is the expected return to each asset g and w_g is the weight assigned individually to each asset g.

The standard deviation of returns is used to calculate variances for an asset class and co-variances between asset classes. The optimal combination of assets will minimize the overall risk to the portfolio. Algebraically, the measure of risk for a multiple-asset portfolio can be stated as follows[5]:

$$\text{var}(R_p) = \sum_{g=1}^{G} {w_g}^2 \text{var}(R_g) + \sum_{\substack{g=1 \\ for\ h \neq g}}^{G} \sum_{h=1}^{H} w_g w_h \text{cov}(R_g R_h)$$

[4] Fabozzi and Modigliani, p. 154.
[5] ibid.

In this equation, var(R_p) is the variance in the return to the portfolio, w_g is the weight assigned individually to each asset g, R_g is the expected return to each respective asset g, w_h is the weight assigned to every other asset that is not asset g and R_h is the expected return to asset h. In words, the portfolio variance is the sum of the individual asset variances multiplied by the squared weight of total wealth allocated to those assets, plus the sum of the products of the co-variances of each individual asset, weighted by proportion of wealth allocated to each asset within the entire portfolio. To summarize further, the total variance in the return to the portfolio is made of two parts: the individual variance components and the co-variances component. Excel Solver is used to calculate maximum portfolio returns by varying the weights of each asset class while constrained at a fixed standard deviation or level of risk. Solver creates the optimal portfolio share of each asset class that maximizes total portfolio return at each respective variance limit.

The University of Illinois endowment pool is used as a proxy for the asset classes to include in the optimization exercise due to its reasonable and prudent investment goals. The pool's objective is to obtain a reasonable return with a manageable amount of risk within a long-term investment horizon. The endowment pool's standard deviation of returns from 2002 through the end of 2009 was approximately 12.5%. The target asset allocation for the UI endowment pool as of the date of this research is:

- U.S. Equity 51.5%
- Non-U.S. Equity 15.0%
- Private Equity 5.0%
- Fixed Income 21.5%
- Endowment Farmland 7.0%

The asset classes selected for this analysis are large company stocks, small company stocks, long-term corporate bonds, long-term government bonds, intermediate-term government bonds and the UI farmland portfolio. U.S. Treasury bills were excluded due to their relatively short-term time horizon. Private equity and other alternative assets were excluded from this analysis due to the dearth of historical performance data for those asset classes.

Return series and standard deviations of those returns from 1962-2008 are used to create portfolios with specific fixed values for total portfolio risk. The two constraints in place for each scenario are that the percentage share from each asset class cannot be a negative number and the sum of the percentage shares must total 100%. Microsoft Excel Solver is used to create optimal portfolio sets for the following scenarios:

1. E-V frontier without farmland
2. E-V frontier with farmland
3. E-V frontier with farmland limited to a maximum of 15%

The comparison between (1) and (2) above illustrates how the addition of Illinois farmland to a diversified portfolio of assets creates a superior E-V frontier compared to a portfolio without farmland. The third scenario illustrates the effect of the UI endowment pool's policy limit of 15% to farmland.

Capital Asset Pricing Model – Assessing Return and Risk

The Capital Asset Pricing Model (CAPM) is an asset pricing model that bases its asset prices on risk[6]. In the context of this analysis, the model measures the systematic risk of an asset class under evaluation for possible inclusion in a well-diversified portfolio. Systematic risk is

[6] For a more thorough explanation of CAPM theory, refer to Fabozzi and Modigliani (2009), pp. 168-180.

the non-diversifiable market risk inherent in all investment opportunities that cannot be eliminated by diversification. Non-systematic risk is diversifiable and results in no risk premium in CAPM theory. The measure of the asset class' sensitivity to market risk is called beta (β). Beta gauges the volatility of an asset in response to external stimuli, relative to the response of the overall market. If the asset class has a beta of 1.0, its systematic risk is equal to that of the market. A beta greater than 1.0 indicates the asset is riskier than the market whereas a beta less than 1.0 corresponds to a less risky variation of returns for that asset. Farmland as an asset class typically has beta values well under 0.5 in response to variability in market returns.[7]

The market portfolio created for this CAPM exercise uses the following asset classes and weights:

- large company stocks $51^1/_2$%
- small company stocks 20%
- long-term corporate bonds $7^1/_6$%
- long-term government bonds $7^1/_6$%
- intermediate-term government bonds $7^1/_6$%
- UI farmland portfolio 7%

The first five asset classes are selected because of the relative ease of obtaining the data from the Ibbotson SBBI 2009 Yearbook. In addition, these asset classes and weights are compatible with the UI endowment pool as a reasonable example of a well-diversified "market" portfolio.

A return premium for an investment should be expected by an investor who is willing to bear its systematic risk. The algebraic formula for CAPM is:

$$E(R_j) = R_f + \beta_j[E(R_m) - R_f]$$

[7] Barry (1980) reported a beta value of 0.19 for U.S. farmland and Irwin, et al (1988) reported beta values between 0.15 and 0.32 in their models of U.S. farmland.

$E(R_j)$ is the expected return on asset j, R_f is the rate of return on the risk-free asset, β_j is the market beta for asset j and $E(R_m)$ is the expected market return. The expression "$E(R_m) - R_f$" represents the market premium that should be paid to investors to compensate for systematic risk. The CAPM formula means that the beta value for asset j determines the level of risk premium required to compensate for the risk asset j would add to the portfolio. Expressed another way, asset j's risk premium equals its beta value multiplied by the market premium:

$$E(R_j) - R_f = \beta_j[E(R_m) - R_f]$$

Irwin, Forster and Sherrick (1988) concluded that "returns [to farm real estate] have been systematically related to uncertain inflation." Their results found that farm real estate responded to inflation but was negatively correlated with every other important asset class except residential housing. The algebraic formula they used for CAPM with an added factor for the effects of uncertain inflation is as follows:

$$E(R_j) = R_f + \beta_{1j}[E(R_m) - R_f] + \beta_{2j}[E(\pi) - R_f]$$

$E(R_j)$ is the expected return on asset j, R_f is the rate of return on the risk-free asset, β_{1j} is the market beta for asset j, $E(R_m)$ is the expected market return, β_{2j} is the inflation beta for asset j and $E(\pi)$ is the expected rate of inflation.

The CAPM regressions are run using Microsoft Excel. Four periods are explored, each modeled with and without an inflation factor. These periods are 1962-2008, 1962-1986, 1987-2008 and 1962-2002. The alpha and beta regression coefficients for the UI farmland portfolio are derived for each model. Alpha is expected to have a zero value because a positive value represents excess returns above what CAPM assumes is required to compensate investors for systematic risk.

T-statistics for the dependent variable and independent variables are examined to gauge for statistical significance of the results. The coefficient of determination, R^2, measures the extent to which the UI farmland portfolio's financial performance can be explained by the independent variable(s). R^2 values can range from 0 to 1, where 0 indicates no explanation by the independent variable(s) and 1 indicates the model is a complete explanation.

Serial autocorrelation is measured by checking the Durbin-Watson values to determine if they are under the allowable lower boundary. Due to limitations in Excel's capabilities, indications of serial autocorrelation results in SAS being programmed to run the Cochrane-Orcutt estimation method to correct the problem by re-estimating the error terms.

Summary

This chapter describes the periods for which asset classes returns, standard deviations and correlations are calculated. Optimal portfolio modeling is introduced as a dynamic method for assembling a diverse portfolio of assets that either maximizes return or minimizes risk. The CAPM allows for effective pricing of an investment based on the systematic risk it would add to a well-diversified portfolio. The foregoing methodologies are used to produce the outcomes revealed in Chapter 5.

CHAPTER 5

RESULTS

Introduction

This chapter is divided into five sections and provides results covering several periods. The first section examines the individual farms and evaluates their financial performance to the total UI farmland portfolio. The second section compares the UI farmland portfolio to other major asset classes in terms of return, variability of return and correlation of returns among asset classes. The third section conducts optimal portfolio modeling in search of efficient use of risk to achieve optimal portfolio returns. The fourth section shows regression results for the UI farmland portfolio returns against a diversified market portfolio and inflation to measure the extent to which farmland's return compensates investors for the price they must pay for it. The fifth section is a summary of the results.

Comparison of Individual Farms to Total UI Farm Portfolio

A comparison of returns and standard deviations for individual farms and group portfolios is shown below in Table 5.1. The Allerton farm is approximately 44% of the total portfolio in terms of tillable acreage and is the most dominant force behind total portfolio performance. The range in geometric means is between 6.0% at the Hunter Research farm and 11.4% at the Carter-Pennell farm. White corn has been produced on the Hunter Research farm for many years and receives a premium over yellow corn. Raising white corn did not increase returns and may in fact have decreased returns. The Hunter Research farm has a relatively high cash lease in place beginning in 2008, and the UI's return is expected to increase with less variability. The Carter-Pennell farm has some of the poorest soils in the entire portfolio, which

is the major driver behind its lower estimated land value per acre. In spite of one of the highest variability of return, the smaller denominator (land value) in the total return calculation makes the Carter-Pennell farm the top performer in the portfolio. The performance of three portfolios based on the farms' geography is shown in Table 5.1 for comparison purposes.

Table 5.1. Comparison of Returns and Standard Deviations.

Farm	Years of Data	Tillable Acres	Geometric Mean	Mean	Standard Deviation
Allerton	1962-2008	3,380	9.4%	10.0%	11.8%
Campbell	1977-2008	85	6.3%	6.7%	9.4%
Carter-Pennell	1962-2008	319	11.4%	12.1%	13.2%
DeHart	1976-2008	116	7.4%	7.9%	10.3%
Hackett	1970-2008	365	8.9%	9.6%	12.8%
Hubbell	1973-2008	157	9.7%	10.5%	13.3%
Hunter Research	1976-2008	244	6.0%	6.4%	9.2%
Hunter Scholarship	1976-2008	1,216	7.3%	8.0%	12.1%
Warren	1970-2008	119	9.7%	10.4%	12.9%
Weber	1970-2008	774	9.3%	10.0%	12.9%
Wright	1970-2007	870	8.5%	9.2%	12.9%
Eastern Portfolio[1]	1962-2008	4,785	9.4%	10.0%	11.7%
Western Portfolio[2]	1976-2008	1,216	7.3%	8.0%	12.1%
Northern Portfolio[3]	1970-2008	1,644	8.8%	9.6%	12.7%
Total Portfolio	1962-2008	7,644	9.3%	9.9%	11.8%

[1]The Eastern Portfolio contains the Allerton, Campbell, Carter-Pennell, DeHart, Hubbell, Hunter-Research and Warren farms.

[2]The Western Portfolio contains the Hunter-Scholarship farm.

[3]The Northern Portfolio contains the Weber and Wright farms.

The Eastern portfolio is dominated by the Allerton farms, and its overall performance is a near match to Allerton. The Western portfolio contains only the Hunter Scholarship farms and its performance was inferior to the total UI farmland portfolio and the other two geographic portfolios. Its lower performance can largely be explained by the period of data; the Hunter Scholarship farms were received in 1976 and, therefore, the performance history does not include the farmland values boom of 1973-1976. An example of nearly the exact opposite of the explanation for the Carter-Pennell farm's return and standard deviation is the Northern portfolio.

This portfolio experienced lower current returns due to the high magnitude of the denominator in that equation. Farmland values in Northern Illinois appreciated more in the recent past due to residential, commercial and industrial development pressures from surrounding metropolitan areas.

The standard deviations of total return for the portfolio range from a low of 9.2% for the Hunter-Research farm to a high of 13.3% for the Hubbell farm. The Carter-Pennell farm has a standard deviation of 13.2%. It is noteworthy that the Hubbell and Carter-Pennell farms have the lowest soil Productivity Index (PI) values in the portfolio at 126 and 114, respectively. The Hunter-Research farm has PI of 142, which is the highest in the portfolio. The total UI farmland portfolio standard deviation is 11.8% and has an acre-weighted PI of 137. There seems to be a relationship between PI and variability of returns; farms with the lowest PI may be less resilient in response to the vagaries of weather patterns, soil moisture and pest management. Farms with higher PI values, on the other hand, are assumed to produce relatively larger crops under less favorable growing conditions than their counterparts with the lower PI values.

A further analysis of the total portfolio reveals that its current acre-weighting is superior to a hypothetical portfolio of farms with *equal* acreages and individual returns identical to those in Table 5.1. The equal weighting scenario produced a total return of 8.5% and a standard deviation of 11.9 for the hypothetical portfolio. By comparison, Table 5.1 shows the acre-weighted total return and standard deviation for the Total Portfolio to be 9.3% and 11.8%, respectively. The simple explanation for these differences is that the larger farms (Allerton, Weber) have some of the highest returns. With the exception of the Hunter Scholarship farm, the lowest returns are on the smaller farms.

Table 5.2 below deviates from the previous table by comparing returns across the 1977-2007 period during which all 11 farms were present in the UI Farm Portfolio. The lower total return values compared with the 1962-2008 period are primarily explained by the absence of the boom in Illinois farmland prices experienced during 1973-1976. The presence of smoothing bias in the relatively small range of standard deviations (9.0% to 9.6%) is due to the dominance of the indexing approach used to adjust estimates of land values.

Table 5.2. Comparison of Returns and Standard Deviations for Common Period 1977-2007.

Farm	Tillable Acres	Geometric Mean	Mean	Standard Deviation
Allerton	3,380	6.2%	6.6%	9.0%
Campbell	85	5.9%	6.4%	9.4%
Carter-Pennell	319	7.7%	8.1%	9.6%
DeHart	116	6.2%	6.7%	9.2%
Hackett	365	5.6%	6.0%	9.2%
Hubbell	157	6.4%	6.8%	9.2%
Hunter Research	244	5.5%	5.9%	9.2%
Hunter Scholarship	1,216	5.7%	6.1%	9.0%
Warren	119	6.8%	7.2%	9.5%
Weber	774	5.9%	6.3%	9.2%
Wright	870	5.0%	5.5%	9.5%
Eastern Portfolio[1]	4,785	6.2%	6.6%	9.1%
Western Portfolio[2]	1,216	5.7%	6.1%	9.0%
Northern Portfolio[3]	1,644	5.4%	5.8%	9.4%
Total Portfolio	7,644	5.9%	6.3%	9.1%

[1]The Eastern Portfolio contains the Allerton, Campbell, Carter-Pennell, DeHart, Hubbell, Hunter-Research and Warren farms.

[2]The Western Portfolio contains the Hunter-Scholarship farm.

[3]The Northern Portfolio contains the Weber and Wright farms.

The UI farm portfolio exhibits strong correlation within its member farms, regions and the overall total portfolio. The high correlation is 1.0 in several instances and the low correlation is 0.78. This outcome is not surprising given that there is a great deal of commonality in soil

types, geographical representation, input prices, weather patterns and crop choices among the farms. Table 5.3 contains the correlation of total returns between farms and the total UI farm portfolio.

Table 5.3. UI Farm Portfolio Correlation of Total Returns 1962-2008.

Farm	Allerton	Campbell	Carter-Pennell	DeHart	Hackett	Hubbell	Hunter Research	Hunter Scholarship	Warren	Weber	Wright	Eastern Portfolio	Western Portfolio	Northern Portfolio	**Total Portfolio**
Allerton	1.00	0.94	0.96	0.97	0.99	0.99	0.80	0.98	0.99	0.99	0.97	1.00	0.98	0.98	1.00
Campbell		1.00	0.92	0.94	0.94	0.94	0.93	0.94	0.93	0.94	0.93	0.94	0.94	0.93	0.94
Carter-Pennell			1.00	0.98	0.98	0.97	0.85	0.98	0.96	0.97	0.95	0.97	0.98	0.96	0.97
DeHart				1.00	0.98	0.97	0.91	0.96	0.96	0.97	0.98	0.98	0.96	0.97	0.98
Hackett					1.00	0.99	0.81	0.99	0.98	0.99	0.97	1.00	0.99	0.98	1.00
Hubbell						1.00	0.80	0.99	0.98	0.99	0.99	0.99	0.99	0.99	0.99
Hunter Research							1.00	0.78	0.78	0.81	0.83	0.83	0.78	0.82	0.82
Hunter Scholarship								1.00	0.97	0.98	0.99	0.98	1.00	0.98	0.99
Warren									1.00	0.98	0.96	0.99	0.97	0.97	0.99
Weber										1.00	0.98	0.99	0.98	0.99	1.00
Wright											1.00	0.97	0.99	1.00	0.98
Eastern Portfolio												1.00	0.98	0.98	1.00
Western Portfolio													1.00	0.98	0.99
Northern Portfolio														1.00	0.99
Total Portfolio															1.00

The financial performance of the total UI farm portfolio comparison to farmland across the State of Illinois as reported to USDA is shown in Table 5.4. The returns by decade illustrate the boom of the 1970s and the bust of the early-to-mid 1980s. The 1987-2008 period experienced a rebound following the bust with significantly less volatility of returns than the 1970s boom. There is likely a difference in methodology for reporting farm net income between the UI process and that of farm owners and operators across the State of Illinois that reported data to USDA. University Accounting and Financial Reporting (UAFR) thoroughly accounts for

every possible depreciable asset, hence the noticeable difference in returns. UAFR's strict approach to depreciating old and/or obsolete buildings on UI farms is perfectly fitting with accounting methods for public entities but is quite different from farm management industry norms.

Table 5.4. UI Farmland Portfolio and Statewide Illinois Farmland Total Return Comparison.

	UI Farm Portfolio			Statewide Illinois Farmland*		
Time Period	**Geometric Mean**	**Mean**	**Standard Deviation**	**Geometric Mean**	**Mean**	**Standard Deviation**
Entire Time Period:						
1962-2008	9.3%	9.9%	11.8%	N/A	N/A	N/A
By Decade:						
1962-1970	9.1%	9.3%	6.5%	N/A	N/A	N/A
1971-1980	19.7%	20.5%	15.0%	22.6%	23.1%	11.7%
1981-1990	-0.2%	0.5%	12.4%	2.9%	3.4%	10.9%
1991-2000	7.1%	7.3%	5.3%	10.4%	10.5%	3.1%
2001-2008	12.2%	12.3%	5.9%	13.3%	13.5%	7.5%
Other Sub-Periods:						
1962-1986	8.9%	9.9%	15.4%	N/A	N/A	N/A
1987-2008	9.7%	9.8%	5.6%	12.0%	12.1%	5.3%
1962-2002	8.5%	9.2%	12.4%	N/A	N/A	N/A
1970-2008	9.2%	9.9%	12.6%	11.9%	12.5%	11.2%

* Source: USDA

Comparison of UI Farm Portfolio to Other Major Asset Classes

Table 5.5 below compares the returns of major asset classes, the UI farmland portfolio, USDA-reported Illinois farmland returns, the market portfolio modeled after the UI endowment pool asset allocation and inflation.

Table 5.5. Comparison of Total Return Among Asset Classes.

Nominal Rates of Geometric Total Return on UI Farm Portfolio, USDA IL Farmland, Other Asset Classes, Market Portfolio and Inflation

Asset Class	1962-2008	1970-2008	1962-1986	1987-2008	1962-2002	1962-1970	1971-1980	1981-1990	1991-2000	2001-2008
Large Company Stocks	9.0%	9.5%	9.3%	8.6%	10.0%	6.3%	8.5%	13.9%	17.5%	-2.9%
Small Company Stocks	12.5%	11.7%	15.3%	9.4%	13.5%	11.8%	17.5%	9.3%	17.5%	5.1%
Long-Term Corporate Bonds	7.4%	8.9%	6.7%	8.3%	7.7%	2.3%	4.2%	14.1%	9.0%	7.6%
Long-Term Gov't Bonds	7.7%	9.3%	6.2%	9.4%	7.5%	1.3%	3.9%	13.7%	10.3%	9.3%
Intermediate-Term Gov't Bonds	7.3%	8.3%	7.5%	7.2%	7.7%	4.2%	5.7%	12.5%	7.5%	6.5%
UI Farmland Portfolio	9.3%	9.2%	8.9%	9.7%	8.5%	9.1%	19.7%	-0.2%	7.1%	12.2%
Market Portfolio	10.0%	10.4%	10.6%	9.4%	10.7%	7.4%	10.9%	12.3%	15.2%	2.9%
USDA Illinois Farmland	N/A	11.9%	N/A	12.0%	N/A	N/A	22.6%	2.9%	10.4%	13.3%
U.S. Treasury Bills	5.6%	5.8%	6.6%	4.4%	6.0%	4.5%	6.8%	8.5%	4.7%	2.7%
Consumer Price Index	4.2%	4.5%	5.4%	3.0%	4.5%	3.2%	8.1%	4.5%	2.7%	2.4%

Standard Deviation of Total Return on UI Farm Portfolio, USDA IL Farmland, Other Asset Classes, Market Portfolio and Inflation

Asset Class										
Large Company Stocks	17.5%	18.2%	16.4%	19.1%	16.9%	13.5%	20.7%	13.2%	15.3%	21.5%
Small Company Stocks	25.7%	23.8%	28.3%	22.4%	25.0%	35.1%	29.6%	19.0%	16.7%	28.8%
Long-Term Corporate Bonds	10.2%	10.4%	11.9%	8.0%	10.9%	7.7%	8.0%	13.6%	10.8%	4.5%
Long-Term Gov't Bonds	11.1%	11.4%	11.6%	10.6%	11.5%	6.2%	7.0%	14.1%	13.3%	8.5%
Intermediate-Term Gov't Bonds	6.4%	6.5%	7.0%	5.8%	6.6%	5.2%	3.3%	7.6%	7.2%	4.9%
UI Farmland Portfolio	11.8%	12.6%	15.4%	5.6%	12.4%	6.5%	15.0%	12.4%	5.3%	5.9%
Market Portfolio	13.4%	13.5%	13.7%	13.4%	13.1%	13.1%	16.3%	11.0%	11.0%	15.2%
USDA Illinois Farmland	N/A	11.2%	N/A	5.3%	N/A	N/A	11.7%	10.9%	3.1%	7.5%
U.S. Treasury Bills	2.8%	2.9%	2.9%	2.0%	2.6%	1.4%	2.5%	2.7%	1.0%	1.6%
Consumer Price Index	3.0%	3.1%	3.6%	1.3%	3.1%	1.9%	3.7%	2.0%	0.6%	1.3%

Table 5.5 demonstrates the competitive return and risk characteristics of the farm portfolio when compared to the other asset classes. It is worth noting that there is surprisingly little variation in returns over the longer time periods. The 1960s produced a solid return with low variability for the UI farms. Stocks enjoyed a good decade, although with considerable volatility. The 1970s saw inflation exceeding the rate of return on U.S. Treasury Bills and was an excellent decade for Illinois farmland returns. The 1980s experienced falling inflation, the farm economy went bust and other major asset classes experienced an excellent decade. The

negative correlation observed between the UI farmland portfolio and these major asset classes is supported by results shown in Table 5.6. The 1990s generated excellent returns for almost every asset class in the previous table. The UI farmland portfolio continued the modest recovery started in the late 1980s. The first decade of the 2000s is thus far producing excellent returns to the UI farmland portfolio. Stocks are not faring as well but fixed-income is posting good returns.

The 1962-1986 period captured in the previous table demonstrates good returns to the UI farmland portfolio but with significant volatility. The 1987-2008 period shows a reasonable return for all asset classes and decreased volatility in farmland returns compared to 1962-1986.

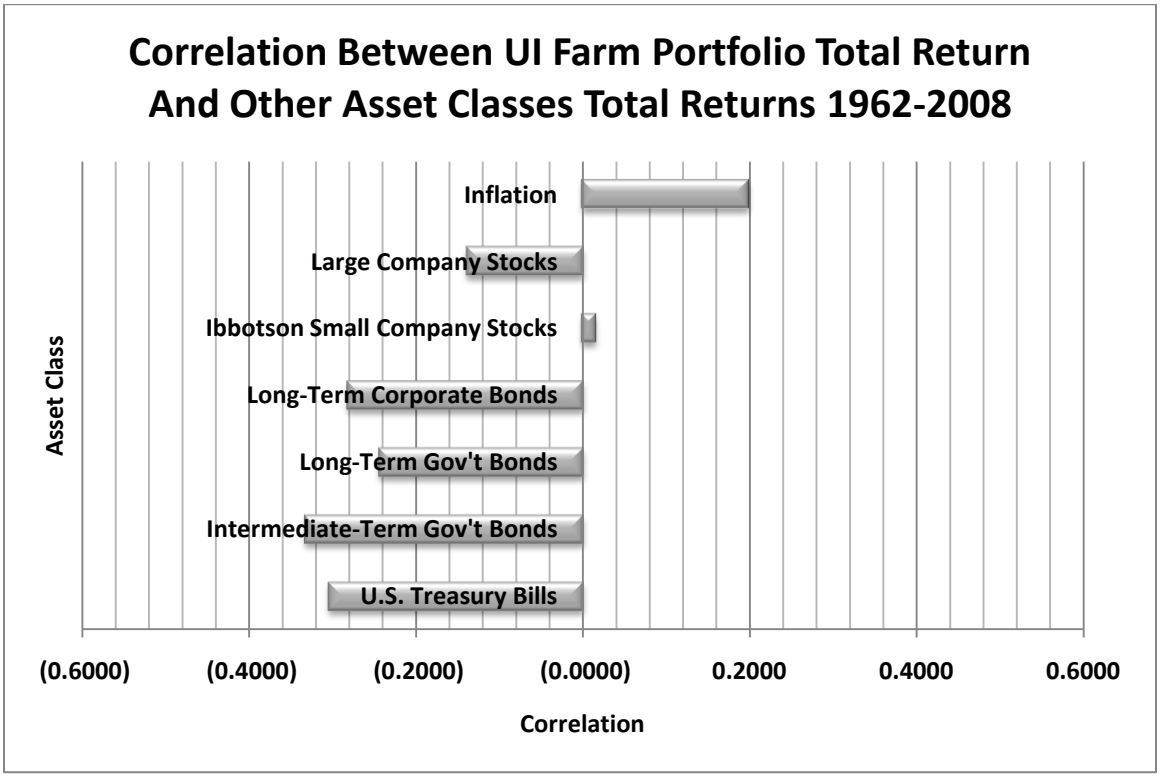
Table 5.6 below provides correlations between the UI farmland portfolio and the asset classes included in this analysis. The UI farmland portfolio is negatively correlated with large company stocks, long-term corporate bonds, long-term government bonds, intermediate-term government bonds and the total market portfolio. Only slight positive correlation exists between the UI farmland and small company stocks. Not surprisingly, the UI farmland portfolio shows a high correlation of 0.87 with USDA Illinois farms total return for the 1970-2008 period.

Table 5.6. Correlations of Total Return Between Asset Classes 1962-2008.

Asset Class	Large Company Stocks	Small Company Stocks	Long-Term Corporate Bonds	Long-Term Gov't Bonds	Intermediate-Term Gov't Bonds	U.S. Treasury Bills	UI Farmland Portfolio	Market Portfolio	Consumer Price Index
Large Company Stocks	1	0.70	0.29	0.12	0.12	0.13	(0.14)	0.96	(0.09)
Small Company Stocks		1	0.06	(0.11)	(0.09)	0.02	0.01	0.85	0.00
Long-Term Corporate Bonds			1	0.92	0.90	0.07	(0.28)	0.34	(0.32)
Long-Term Gov't Bonds				1	0.91	0.04	(0.24)	0.16	(0.31)
Intermediate-Term Gov't Bonds					1	0.31	(0.33)	0.17	(0.11)
U.S. Treasury Bills						1	(0.30)	0.09	0.68
UI Farmland Portfolio							1	(0.07)	0.20
Market Portfolio								1	(0.09)
Consumer Price Index									1

The following figure illustrates the data shown in the Table 5.6.

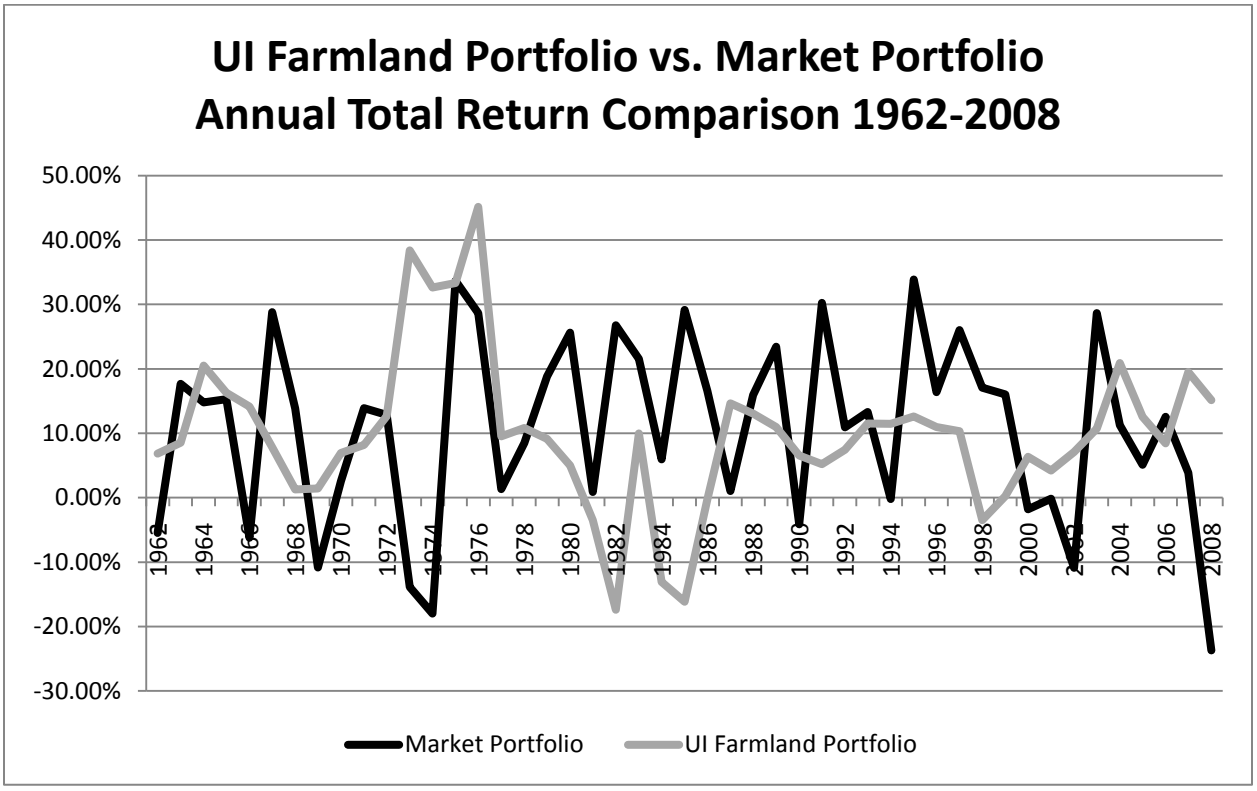
Figure 5.1. Correlations of Total Return Between the UI Farmland Portfolio Other Asset Classes and Inflation 1962-2008.



It is worth noting that the UI farmland portfolio has a positive but low correlation of 0.20 with the Consumer Price Index for the 1962-2008 period. Similar tables showing the correlations for the other sub-periods are available in Appendix B.

Figure 5.2 further illustrates the negative correlation of total return between the UI Farmland Portfolio and the market portfolio by showing annual returns for the period of 1962-2008.

Figure 5.2. Annual Total Return Comparison: UI Farmland and Market Portfolio.



The results displayed in this section clearly show the favorable implications of holding Illinois farmland within a portfolio. The total return is competitive with other asset classes, and Illinois farmland tracks somewhat with inflation. The standard deviation of returns for Illinois

farmland is reasonable and its negative correlation with returns of other asset classes indicates it complements a well-diversified portfolio by enhancing its return and risk profile. This premise is explored in more detail in the subsequent sections on Optimal Portfolio Modeling and Capital Asset Pricing Model.

Optimal Portfolio Modeling

Constrained optimization using Microsoft Excel Solver is setup to model optimal diversified portfolios with maximized returns for specific levels of risk. Table 5.7 illustrates the data and how they are used to populate the Solver template. As stated in the previous chapter, the UI endowment pool's standard deviation of returns from 2002 through the end of 2009 was approximately 12.5%. The example below calculates the variance at a standard deviation of 12.5%; this variance is entered in the Solver template as a constraint.

Table 5.7. Source Data and Output for Portfolio Optimization using Microsoft Excel Solver.

Portfolio Optimization - Markowitz Method

Each cell constrained to be ≥ zero; these variables change to maximize return.

	Large Company Stocks	*Small Company Stocks*	*Long-Term Corp. Bonds*	*Long-Term Gov't Bonds*	*Int.-Term Gov't Bonds*	*UI Farmland Portfolio*	
Data Summary 1962-2008							
Portfolio Share	0.00%	42.49%	0.00%	3.46%	0.00%	54.05%	100.00%
Expected Return ($E(R_i)$)	8.97%	12.47%	7.44%	7.67%	7.35%	9.28%	
Standard Deviation (σ)	17.53%	25.67%	10.20%	11.14%	6.39%	11.78%	
Variance/Covariance Matrix							
Large Company Stocks	0.0301	0.0310	0.0051	0.0023	0.0013	(0.0028)	
Small Company Stocks	0.0310	0.0645	0.0016	(0.0032)	(0.0014)	0.0004	
Long-Term Corporate Bonds	0.0051	0.0016	0.0102	0.0103	0.0058	(0.0033)	
Long-Term Gov't Bonds	0.0023	(0.0032)	0.0103	0.0121	0.0008	(0.0031)	
ıtermediate-Term Gov't Bond	0.0013	(0.0014)	0.0058	0.0008	0.0040	(0.0024)	
UI Farmland Portfolio	(0.0028)	0.0004	(0.0033)	(0.0031)	(0.0024)	0.0136	
Variance Terms	-	0.0117	-	(0.0001)	-	0.0040	**Variance** 0.0156
Return Terms	0.00%	5.30%	0.00%	0.27%	0.00%	5.01%	**Standard Deviation** 12.50%
							Return 10.58%

Constrained to result in a desired fixed value for each level of risk modeled; sum of six values to the left.

SUMPRODUCT of each *Portfolio Share* value and each asset class value from the Variance/Covariance

Target Cell value to be maximized.

Table 5.8 shows optimal asset allocations for several models at feasible risk levels. The UI endowment pool's standard deviation of 12.5% is highlighted as a point of reference in all three parts of the table. Integer values below 4% were not feasible and integer values above 21% produced models that were increasingly allocated toward 100% small company stocks. The top part of the table displays Solver models constrained for nine different fixed portfolio variance values. UI farmland is included in the top part. The middle part of the table shows eight models, each excluding UI farmland from the portfolios. The bottom set of data shows the various asset allocations when the UI farmland is limited to no more than 15% of the total portfolio. In every case, increasing the allocation to UI farmland to the 15% maximum limit was optimal.

Table 5.8 shows that at every portfolio standard deviation value, the return is higher when UI farmland is included in the asset allocation. As was previously stated, the approved policy for the University of Illinois endowment pool limits the allocation to farmland to no more than 15% of the total pool value. Even if UI farmland is limited to no more than 15% of the total portfolio, return is higher when the farmland is included versus the portfolios without farmland. Comparing the top two parts of Table 5.8 shows that when UI farmland is allowed into the portfolios, allocations to small company stocks and government bonds diminish to give allocations to farmland. The conclusion from these observations is that the addition of UI farmland in these portfolios improves the return, the standard deviation or both of these elements.

Table 5.8. Output from Microsoft Solver used to Generate E-V Frontiers.

	Large Company Stocks	*Small Company Stocks*	*Long-Term Corp. Bonds*	*Long-Term Gov't Bonds*	*Int.-Term Gov't Bonds*	*UI Farmland Portfolio*
Expected Return ($E(R_i)$)	*8.97%*	*12.47%*	*7.44%*	*7.67%*	*7.35%*	*9.28%*
Standard Deviation (σ)	*17.53%*	*25.67%*	*10.20%*	*11.14%*	*6.39%*	*11.78%*

Portfolio Allocations (Asset Classes Sum to 100%, Return Maximized, Constrained to Fixed Standard Deviations)

Model:	*Asset Allocation*						*Variance*	*Std. Dev.*	*Return*	*C.V.*
Standard Deviation = 4%	0.00%	4.43%	0.00%	18.22%	52.43%	24.92%	0.0016	4.00%	8.11%	0.49
Standard Deviation = 6%	0.00%	17.95%	0.00%	18.56%	25.49%	38.00%	0.0036	6.00%	9.06%	0.66
Standard Deviation = 8%	0.00%	25.40%	0.00%	18.45%	10.89%	45.26%	0.0064	8.00%	9.58%	0.83
Standard Deviation = 10%	0.00%	32.72%	0.00%	16.63%	0.00%	50.65%	0.0100	10.00%	10.06%	0.99
Standard Deviation = 12.5%	0.00%	42.45%	0.00%	3.37%	0.00%	54.18%	0.0156	12.50%	10.58%	1.18
Standard Deviation = 15%	0.00%	55.03%	0.00%	0.00%	0.00%	44.97%	0.0225	15.00%	11.04%	1.36
Standard Deviation = 17%	0.00%	64.70%	0.00%	0.00%	0.00%	35.30%	0.0289	17.00%	11.35%	1.50
Standard Deviation = 19%	0.00%	73.64%	0.00%	0.00%	0.00%	26.36%	0.0361	19.00%	11.63%	1.63
Standard Deviation = 21%	0.00%	82.15%	0.00%	0.00%	0.00%	17.85%	0.0441	21.00%	11.90%	1.76

Portfolio Allocations (Return Maximized, Exclude Farmland, Constrained to Fixed Standard Deviations)

Standard Deviation = 6%	0.00%	16.74%	0.00%	23.67%	59.59%	0.0036	6.00%	8.28%	0.72
Standard Deviation = 8%	0.00%	29.02%	0.00%	26.02%	44.96%	0.0064	8.00%	8.92%	0.90
Standard Deviation = 10%	0.00%	38.39%	0.00%	27.67%	33.94%	0.0100	10.00%	9.41%	1.06
Standard Deviation = 12.5%	0.00%	48.97%	0.00%	30.48%	20.56%	0.0156	12.50%	9.96%	1.26
Standard Deviation = 15%	0.00%	59.09%	0.00%	32.37%	8.54%	0.0225	15.00%	10.48%	1.43
Standard Deviation = 17%	0.00%	67.05%	0.00%	32.95%	0.00%	0.0289	17.00%	10.89%	1.56
Standard Deviation = 19%	0.00%	75.27%	0.00%	24.73%	0.00%	0.0361	19.00%	11.29%	1.68
Standard Deviation = 21%	0.00%	83.20%	0.00%	16.80%	0.00%	0.0441	21.00%	11.67%	1.80

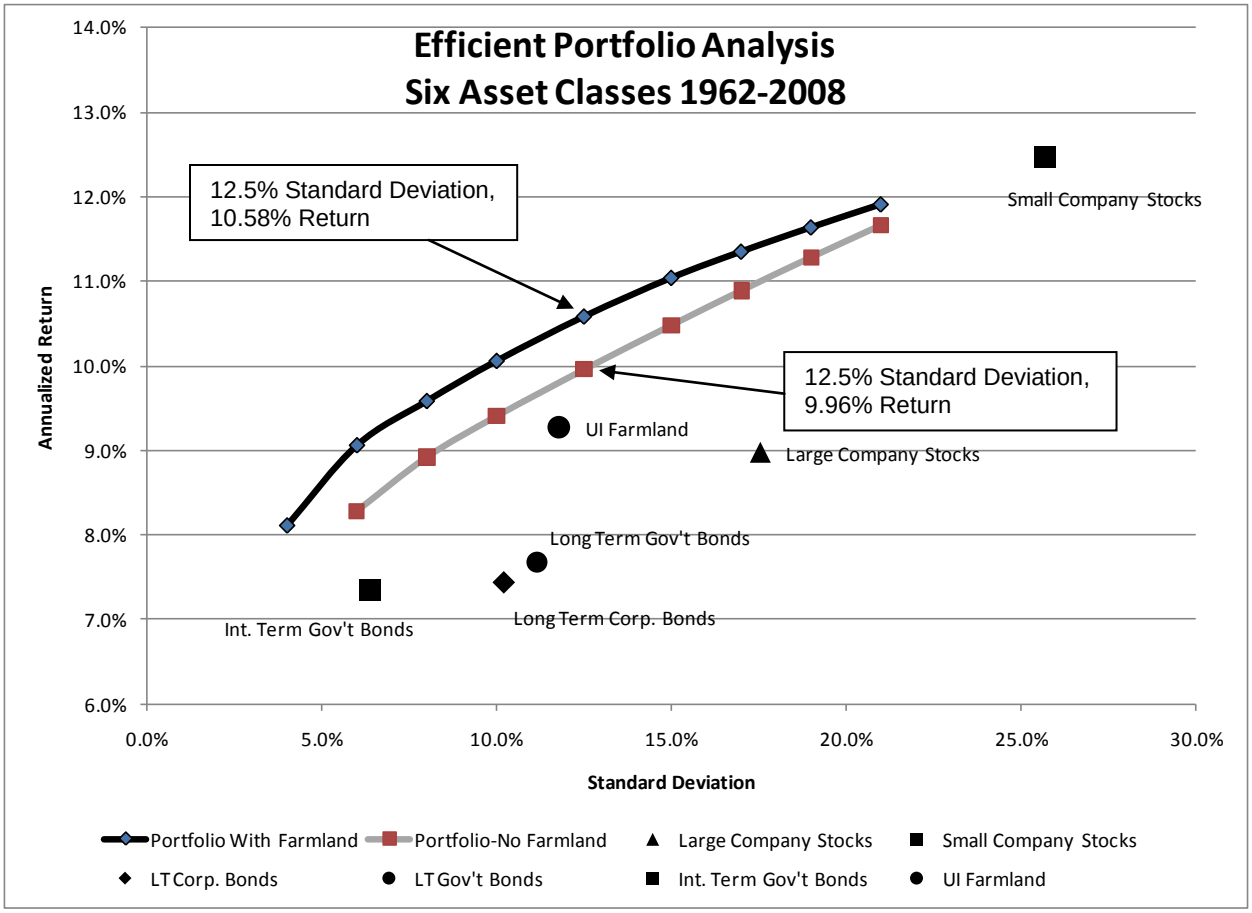
Portfolio Allocations (15% Limit on Farmland, Return Maximized and Constrained to Fixed Standard Deviations) - Not Plotted

Standard Deviation = 5%	0.00%	15.17%	0.00%	21.21%	48.62%	15.00%	0.0025	5.00%	8.48%	0.59
Standard Deviation = 6%	0.00%	21.15%	0.00%	22.30%	41.55%	15.00%	0.0036	6.00%	8.79%	0.68
Standard Deviation = 8%	0.00%	30.64%	0.00%	23.67%	30.69%	15.00%	0.0064	8.00%	9.28%	0.86
Standard Deviation = 10%	0.00%	39.04%	0.00%	26.25%	19.71%	15.00%	0.0100	10.00%	9.72%	1.03
Standard Deviation = 12.5%	0.00%	49.07%	0.00%	28.55%	7.38%	15.00%	0.0156	12.50%	10.25%	1.22
Standard Deviation = 15%	0.00%	59.09%	0.00%	25.91%	0.00%	15.00%	0.0225	15.00%	10.75%	1.40
Standard Deviation = 17%	0.00%	67.11%	0.00%	17.89%	0.00%	15.00%	0.0289	17.00%	11.14%	1.53
Standard Deviation = 19%	0.00%	74.86%	0.00%	10.14%	0.00%	15.00%	0.0361	19.00%	11.51%	1.65
Standard Deviation = 21%	0.00%	82.43%	0.00%	2.57%	0.00%	15.00%	0.0441	21.00%	11.87%	1.77

Markowitz portfolio theory creates portfolios positioned on the E-V frontier that have the highest return possible for their respective levels of risk. The following figure models two portfolio strategies with the standard deviation of returns ranging between the feasible lower limit of 4% and 21%, where a growing trend toward 100% small company stocks was observed. The blue/diamond E-V frontier line includes the UI Farmland Portfolio and the red/square E-V

frontier line excludes farmland. The scenario with a 15% portfolio limit on farmland is excluded from Figure 5.3. If that scenario had been plotted, the line would lie between the two E-V frontier lines shown below. Each of the asset classes included in the portfolios are plotted individually with their respective return and risk values. The Standard Deviation and Return columns in the table are the source data for the E-V frontier lines in Figure 5.3.

Figure 5.3. E-V Frontiers With and Without Farmland.



Microsoft Excel Solver created optimal portfolio sets for the following scenarios:

1. E-V frontier without farmland (red/square line in figure above)
2. E-V frontier with farmland (blue/diamond line in figure above)

3. E-V frontier with farmland limited to a maximum of 15% (data shown in the bottom third of Table 5.8)

The comparison between (1) and (2) above illustrates how the addition of Illinois farmland to a diversified portfolio of assets creates a superior E-V frontier in contrast to a portfolio without farmland. The third scenario illustrates the constraining effect of the UI endowment pool's policy limit of 15% to farmland on overall portfolio returns.

Capital Asset Pricing Model

The Capital Asset Pricing Model (CAPM) regressions are run in Excel and produce Durbin-Watson values for each model that are below the allowable lower critical value. These Durbin-Watson values indicate positive autocorrelation of each regression's error terms. This problem is not unexpected, given the tendency of farmland values to maintain a positive or negative track for successive time periods due to inertia in the land markets. Both Barry (1980) and Irwin (1988) experienced positive autocorrelation and had to re-estimate their regressions after using the Cochrane-Orcutt iterative method on their error terms. The Cochrane-Orcutt method is programmed in SAS to re-estimate the regressions, iterating the values until convergence. This results in acceptable Durbin-Watson values; the regression output for each model is shown in Table 5.9.

Table 5.9. One and Two Factor Regressions.

Explanatory Variable	One-Factor 1962-2008	One-Factor 1962-1986	One-Factor 1987-2008	One-Factor 1962-2002	Two-Factor 1962-2008	Two-Factor 1962-1986	Two-Factor 1987-2008	Two-Factor 1962-2002
Intercept (alpha)	9.24%	10.82%	9.11%	8.56%	6.13%	-2.12%	8.53%	3.79%
t-statistic	3.94*	2.86*	7.22*	3.02*	1.72	(0.39)	3.11*	0.86
Market (beta 1)	0.04	0.03	0.05	0.06	0.06	0.19	0.06	0.11
t-statistic	0.49	0.25	1.51	0.65	0.81	2.90*	1.33	1.16
Inflation (beta 2)					0.66	1.10	0.30	0.92
t-statistic					1.17	4.47*	0.38	1.38
R^2	0.51	0.75	0.75	0.51	0.53	0.86	0.75	0.54
Standard Error of Regression	0.69%	0.63%	0.08%	0.77%	0.68%	0.37%	0.09%	0.74%
Durbin-Watson	1.98	2.00	1.82	1.98	1.97	1.94	1.77	2.00
E(R$_i$)	5.74%	5.72%	5.81%	5.84%	5.86%	6.43%	5.85%	6.05%
Risk-Free Rate	5.57%	6.62%	4.40%	6.00%	5.57%	6.62%	4.40%	6.00%
Annualized CPI	4.23%	5.35%	2.97%	4.48%	4.23%	5.35%	2.97%	4.48%
Excess Returns	3.67%	4.20%	4.71%	2.56%	0.56%	-8.74%	4.13%	-2.21%

* Denotes significance at the .05 level.

Alpha values in seven of the eight models are positive, and six of these are greater than the corresponding risk-free rate, indicating UI farmland generates excess returns above what is required to compensate for systematic risk. This may also support the argument that the market for farmland is not efficient and that it may be possible to purchase farmland at prices under what CAPM calculates as the required price. However, the farmland market does not perfectly adhere to all assumptions of the CAPM so a pricing inequity may not exist. Market beta values are near zero in each model and robust to the time period, signifying farmland is a low risk asset that complements a well-diversified portfolio. Inflation seems to have little effect on beta values. The beta coefficient for inflation is statistically significant only during the 1962-1986 period. These beta values indicate the relationship of inflation to the UI farmland portfolio returns depends greatly on the period under analysis. The intercept declines in value and the market coefficient increases in each period when inflation is added. These changes are not particularly momentous, but both movements are the inverse of what Irwin, et al (1988) observed during the

1950-1977 and 1947-1984 periods. It is possible that the longer period of 1962-2008 leads to a more accurate conclusion that farmland returns are minimally affected by inflation.

The market beta is statistically significant in only the two-factor model for 1962-1986. In the other seven models, the null hypothesis that the market coefficient is different from zero is not rejected. The values for the market coefficient are not unexpected, given the negative correlation between the UI Farmland Portfolio and the market portfolio.

Summary

The comparison of total return and standard deviations of return for each UI farm reveal that the farms with the poorest soil types have the highest returns but the most variability in those returns. The returns by decade do not vary significantly from returns over longer periods. The individual properties in the UI farmland portfolio produce returns that are highly correlated with one another. In contrast, the UI farmland portfolio's returns are negatively correlated with several other major asset classes: large company stocks, corporate and government bonds and U.S. Treasury bills. The farms' correlation with small company stocks is very close to zero. The UI farmland portfolio is positively correlated with inflation and has a slight negative correlation with a diversified market portfolio containing an asset allocation similar to the UI endowment pool.

The favorable farmland return, standard deviation and negative correlation compared with major asset classes imply that farmland may have a positive effect as an addition to a diversified portfolio of assets. Optimal portfolio modeling and the resulting E-V frontiers confirm this supposition; at every level of risk, portfolios with farmland were superior to portfolios without farmland.

The Capital Asset Pricing Model indicates that the UI farmland portfolio generates excess returns above that required to compensate investors for the systematic risk it would add to a diversified portfolio. When inflation is added to observe its impact on farmland returns, the results indicate a limited effect on beta values. Any inflation effect seems dependent on the period of time under evaluation.

The results of this analysis are compelling – the UI farmland portfolio, although limited in its geographic and crop diversity, is an exceptional addition to a well-diversified portfolio of assets such as the UI endowment pool. Illinois farmland improves the return and risk characteristics of a diversified pool of assets.

CHAPTER 6

SUMMARY AND CONCLUSIONS

Objective

An evaluation of the total return of the University of Illinois (UI) endowment farm portfolio, its risk characteristics and the implications for adding Illinois farmland to a well-diversified investment portfolio is the subject of this study. This final chapter is designed to interpret the results of the research to determine how effectively the original questions are answered. Limitations and opportunities for further research are delineated. Final conclusions are conveyed in the last section.

Methods

Data for the UI farmland portfolio are generated by the individual farms managed by the Agricultural Property Services (APS) office. APS provides the farm data to University Accounting and Financial Reporting (UAFR) for their calculation of net income by farm. The net income and estimated farm valuations are entered in an Excel spreadsheet to calculate total return. For this study, individual farm performance was compared to the total UI farmland portfolio, which was then contrasted with other asset classes, Illinois state-wide farmland and inflation. Return series were divided into sub-periods for closer examination. The "unplanned" UI farmland portfolio was grouped into northern, eastern and western regions to determine if geography had an impact on returns.

Return histories and standard deviations of return for the UI farmland portfolio and other asset classes were used to model optimal portfolios based on either stated risk objectives or return requirements. Models were created to include farmland, exclude farmland or limit

farmland to a fixed share of the total portfolio. A set of data return and risk data points formed the basis for an E-V frontier to identify the portfolio asset allocations making efficient use of risk to achieve maximum returns.

The Capital Asset Pricing Model (CAPM) was selected for use due to the robust results this method produced for Barry (1980) and Irwin, Forster and Sherrick (1988). Regressions were run for selected periods to determine the effects of market returns and inflation on the UI farmland portfolio returns.

Results

The UI farmland portfolio produced a total annual return of 9.3% for the period 1962-2008 with a standard deviation of 11.8%. Inflation was 4.2% during that period. A market portfolio consisting of stocks, bonds and farmland similar to the asset allocation in place for the UI endowment pool produced a 10.0% return with a standard deviation of 13.4% during the same period. However comparable, these data by themselves are fairly inconclusive in aiding decision-makers who want to know how much Illinois farmland, if any, should be added to a well-diversified portfolio to achieve optimal results.

The results in this study verify that the UI farmland portfolio is negatively correlated with large company stocks, long-term corporate and government bonds, intermediate-term government bonds, U.S. Treasury bills and the market portfolio devised as a proxy for the well-diversified UI endowment pool. The UI farmland portfolio is slightly correlated with small company stocks (0.01) and moderately correlated with inflation (0.20). These results imply that farmland will earn a reasonable return while adding diversification to the market portfolio. The

correlation of farmland returns with inflation is consistent with past studies and supports the importance of farmland as an inflation hedge.

In search of empirical evidence to support the implications of the preceding paragraph, Excel is used to create a portfolio optimization model. A variance and covariance matrix is created based on the 1962-2008 return history for farmland and the other asset classes in the market portfolio. The total return for each asset class is used as a proxy for expected return in the model. The optimization models are constrained to a series of fixed standard deviation values above and below the 12.5% standard deviation of the UI endowment pool. These data points produce a mean/variance (E-V) frontier. The same exercise is reproduced with farmland excluded from the model. The result clearly shows the portfolios with farmland have superior returns to the portfolios without farmland at every fixed standard deviation point.

The Capital Asset Pricing Model (CAPM) is employed to further substantiate the UI farmland portfolio performance and contribution to a well-diversified market portfolio. The regression models for farmland with the market portfolio only as the independent variable produce low beta values ranging from 0.03 to 0.06, indicating the UI farmland portfolio adds only a tiny amount of risk to a well-diversified portfolio. When inflation is added as an independent variable, the market portfolio beta values range from 0.06 to 0.19 and are larger in every period compared to the single-factor model. The inflation beta values range from 0.30 to 1.10, but only the latter value is statistically significant at 0.05.

The intercept values decline in every period when inflation is added to the model. Both the decline in intercept values and the increase in market beta values are the inverse of the results observed by Irwin, et al (1988). This indicates the effect of inflation on farmland returns very likely depends on the time period under evaluation. A second variable that may help explain the

outcome is the difference in data sets. This study uses actual farmland portfolio data in this study versus the aggregate farmland return data used by Irwin, et al. The CAPM experimentation calculates excess return for farmland above the requirement to compensate investors for systematic risk in six of the eight models. These excess return values range from 2.6% to 4.7% for the five models with significant intercept values. In every period, the excess return falls when inflation is added as an independent variable. The implication is that the UI farmland portfolio is underpriced based on the positive excess return values produced by the significant models. A caveat that should be added to the previous statement is that the farmland market likely violates some of the assumptions upon which the CAPM is based.

Irwin, Forster and Sherrick (1988) added residential real estate to the market portfolio in their analysis. It is worth noting that residential real estate was the only asset class to have a positive return correlation with the U.S. farm real estate returns in their study. The inclusion of residential real estate may have been the variable that resulted in positive correlation between farm real estate and their market portfolio.

The most salient point regarding the relationship between the UI farmland portfolio and the market portfolio is the negative correlation identified in Table 5.6. Irwin, et al (1988) also stated that risk and return profiles for undiversified farmland investors may not be as favorable as general CAPM results indicate. Indeed, their standard deviation of returns using nationwide USDA data was 7.90% while the UI farm portfolio produces a standard deviation of 11.78%. These two analyses use different timeframes so no solid conclusions are drawn from the differences in risk levels. However, the implication makes intuitive sense – geographic diversity tends to reduce volatility of returns. Even a wider dispersion of farm properties within the State of Illinois would improve the farmland return and risk levels; the more geographically diverse

USDA returns (IL statewide) for the period 1970-2008 produced total return of 11.9% (compared with UI total return of 9.2%) and standard deviation of 11.2% (compared with UI standard deviation of 12.6%).

Conclusion

The UI farmland portfolio provides favorable return, risk and correlation characteristics to such an extent that the E-V frontier/portfolio optimization exercises results in this farmland frequently dominating the asset allocations. The UI farmland portfolio likely has higher volatility of returns than would be expected from a diversified farmland portfolio containing properties from widely dispersed geographic regions. The correlation of total returns between the individual farms and the total UI farm portfolio demonstrates that the farm portfolio is highly correlated to itself. This is not necessarily surprising and supports the implication that diversification to other agricultural asset sub-classes and geographic regions within the portfolio may improve its overall return and risk characteristics.

The CAPM results are robust across all periods whether inflation is factored in or excluded from the model. While the CAPM with uncertain inflation results is somewhat different from previous studies, this may be partially explained by the economic cycles observed during the 1962-2008 period. Farmland values in the early 1980s reached historic high inflation-adjusted prices per acre. Inflation reached double digits during that decade and the farmland prices tumbled heading into the mid-1980s.

This analysis of the UI farmland portfolio holds the advantage of having data from a live portfolio of farms. The results substantiate what previous studies have concluded – Illinois farmland can lower the volatility of an already diversified investment portfolio while providing a

return premium above what is required to compensate for its systematic risk. For this reason, the author recommends that additional UI separately-invested farmland be added to its endowment pool to raise the farmland share of the pool to the 15% policy limit.

These conclusions must be balanced with recognition that illiquidity and thin markets make buying and selling Illinois farmland more challenging than actively traded asset classes with daily liquidity and ownership changes. The challenges with farmland transactions make the idea of holding 50% or more of a market portfolio in farmland, as was suggested by the optimal portfolio modeling, impractical for institutional investors who might have immediate requirements for liquidity. Perhaps the future will bring solutions to these limitations to an extent that makes even greater allocations to farmland a viable reality.

These conclusions open the door to other questions. Future research opportunities include:

- Are these results scalable? Can smaller investors successfully diversify by adding 40 or 80 acres of Illinois farmland to their personal portfolios?
- Can return and risk be further improved by diversifying into timber, almonds, grapes, apples, vegetables and other crops?
- Are there advantages to investing in managed farmland funds or REITs over holding individual farm properties?
- Is it possible to create a reasonable estimate of the cost of illiquidity, thin markets, high transaction costs, tax obligations and indivisibilities so that these costs could be added to optimal portfolio modeling and CAPM studies?
- How might the conclusions be affected as the world economy emerges from recession and demand for corn and soybeans increases? What will be the effect on farm returns?

APPENDIX A

Figure A.1. Allerton Farms Nominal and Real Estimated Value per Acre.

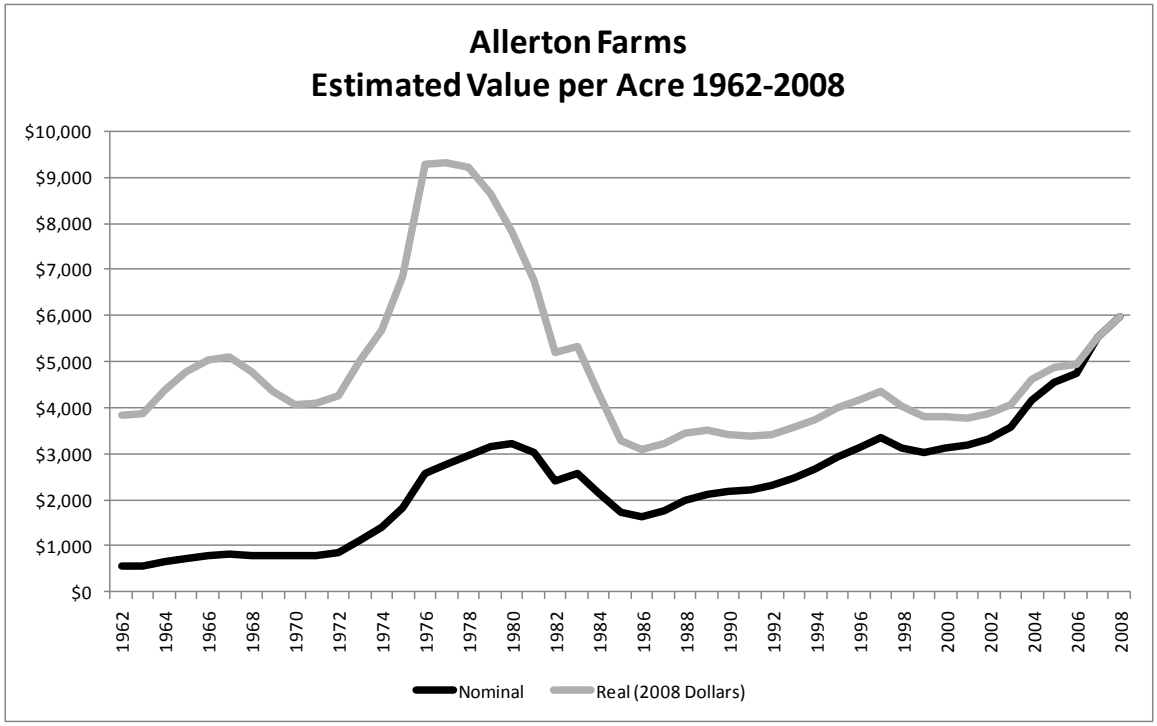


Figure A.2. Allerton Farms Nominal and Real Cash Return.

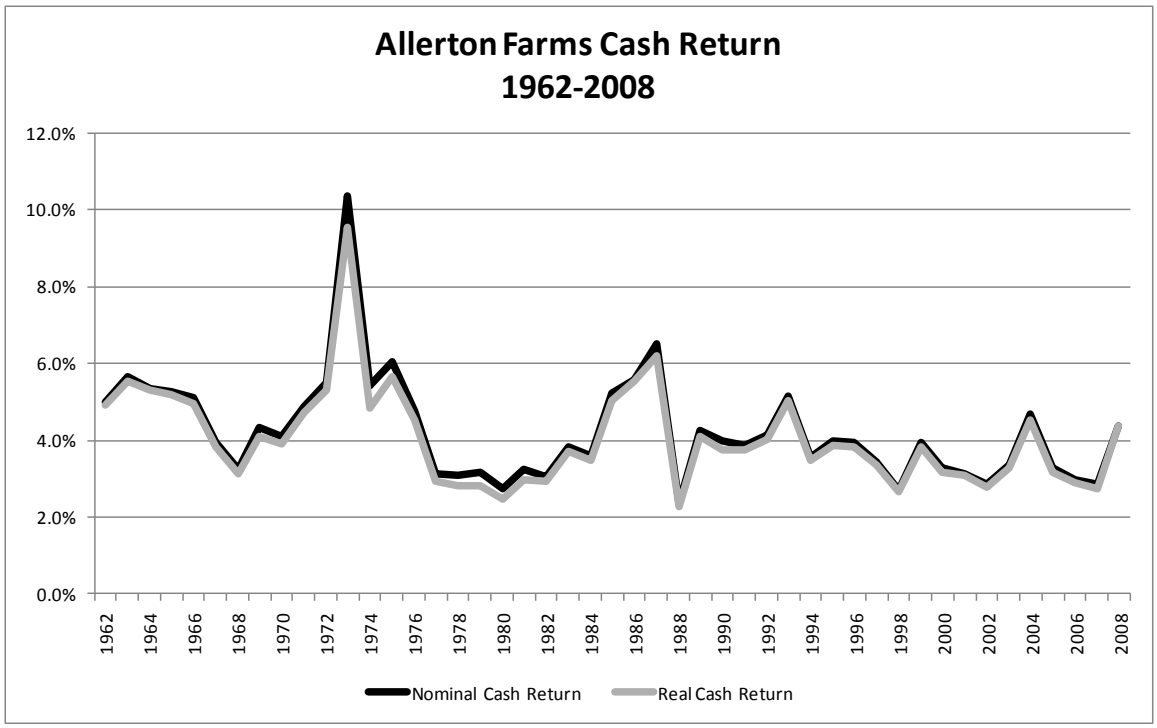


Figure A.3. Allerton Farms Nominal and Real Changes in Land Value.

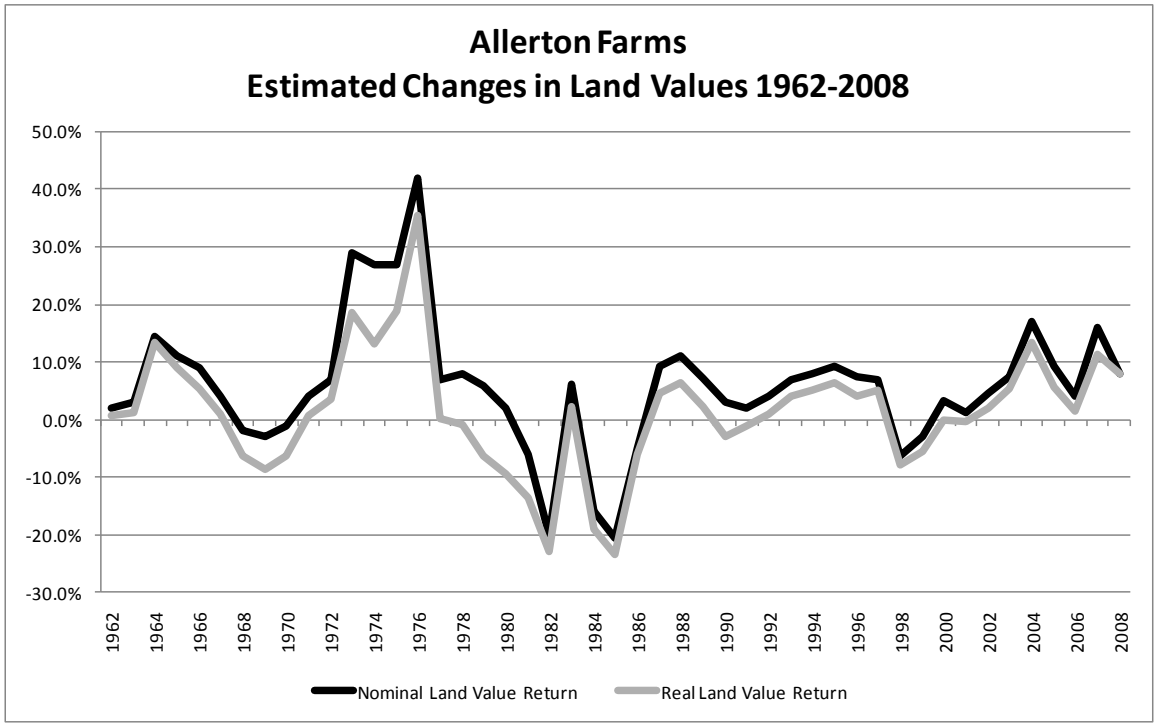


Table A.1. Allerton Farms Financial Data (All dollar values are in thousands).

Allerton Farms

Crop Year	Tillable Acres	Total Acres	Beginning of Year Asset Value	End of Year Asset Value	Net Income	Nominal Cash Return	Nominal Land Value Change	Nominal Total Return	Beginning of Year Asset Value (2008 Dollars)	End of Year Asset Value (2008 Dollars)	Net Income (2008 Dollars)	Real Cash Return	Real Land Value Change	Real Total Return
1961	3,267	3,692	$ -	$ 2,002	$ 101				$ -	$14,029	$ 706			
1962	3,267	3,692	2,002	2,042	100	5.0%	2.0%	7.0%	14,029	14,121	690	4.9%	0.7%	5.6%
1963	3,267	3,692	2,042	2,103	115	5.6%	3.0%	8.6%	14,121	14,309	783	5.5%	1.3%	6.9%
1964	3,267	3,692	2,103	2,408	113	5.4%	14.5%	19.9%	14,309	16,226	759	5.3%	13.4%	18.7%
1965	3,267	3,692	2,408	2,673	127	5.3%	11.0%	16.3%	16,226	17,671	840	5.2%	8.9%	14.1%
1966	3,267	3,692	2,673	2,913	137	5.1%	9.0%	14.1%	17,671	18,617	872	4.9%	5.4%	10.3%
1967	3,267	3,692	2,913	3,030	115	3.9%	4.0%	7.9%	18,617	18,790	711	3.8%	0.9%	4.8%
1968	3,267	3,692	3,030	2,969	99	3.3%	-2.0%	1.3%	18,790	17,585	585	3.1%	-6.4%	-3.3%
1969	3,267	3,692	2,969	2,880	129	4.3%	-3.0%	1.3%	17,585	16,062	717	4.1%	-8.7%	-4.6%
1970	3,267	3,692	2,880	2,852	119	4.1%	-1.0%	3.1%	16,062	15,062	626	3.9%	-6.2%	-2.3%
1971	3,267	3,692	2,852	2,966	139	4.9%	4.0%	8.9%	15,062	15,169	711	4.7%	0.7%	5.4%
1972	3,267	3,692	2,966	3,173	163	5.5%	7.0%	12.5%	15,169	15,696	806	5.3%	3.5%	8.8%
1973	3,307	3,732	3,173	4,093	329	10.4%	29.0%	39.4%	15,696	18,627	1,496	9.5%	18.7%	28.2%
1974	3,218	3,701	4,093	5,199	222	5.4%	27.0%	32.4%	18,627	21,058	900	4.8%	13.1%	17.9%
1975	3,342	3,643	5,199	6,602	315	6.1%	27.0%	33.1%	21,058	25,009	1,194	5.7%	18.8%	24.4%
1976	3,318	3,643	6,602	9,375	314	4.8%	42.0%	46.8%	25,009	33,865	1,134	4.5%	35.4%	39.9%
1977	3,318	3,643	9,375	10,031	292	3.1%	7.0%	10.1%	33,865	33,960	989	2.9%	0.3%	3.2%
1978	3,218	3,643	10,031	10,834	308	3.1%	8.0%	11.1%	33,960	33,643	956	2.8%	-0.9%	1.9%
1979	3,318	3,643	10,834	11,484	345	3.2%	6.0%	9.2%	33,643	31,477	945	2.8%	-6.4%	-3.6%
1980	3,318	3,643	11,484	11,714	316	2.8%	2.0%	4.8%	31,477	28,535	770	2.4%	-9.3%	-6.9%
1981	3,318	3,643	11,714	11,011	378	3.2%	-6.0%	-2.8%	28,535	24,625	846	3.0%	-13.7%	-10.7%
1982	3,322	3,643	11,011	8,809	336	3.0%	-20.0%	-17.0%	24,625	18,974	723	2.9%	-23.0%	-20.0%
1983	3,322	3,643	8,809	9,346	338	3.8%	6.1%	9.9%	18,974	19,396	702	3.7%	2.2%	5.9%
1984	3,322	3,643	9,346	7,860	337	3.6%	-15.9%	-12.3%	19,396	15,692	674	3.5%	-19.1%	-15.6%
1985	3,322	3,643	7,860	6,241	410	5.2%	-20.6%	-15.4%	15,692	12,004	789	5.0%	-23.5%	-18.5%
1986	3,326	3,643	6,241	5,923	348	5.6%	-5.1%	0.5%	12,004	11,268	663	5.5%	-6.1%	-0.6%
1987	3,326	3,643	5,923	6,467	385	6.5%	9.2%	15.7%	11,268	11,782	701	6.2%	4.6%	10.8%
1988	3,386	3,643	6,467	7,185	152	2.4%	11.1%	13.5%	11,782	12,536	266	2.3%	6.4%	8.7%
1989	3,372	3,643	7,185	7,695	307	4.3%	7.1%	11.4%	12,536	12,830	512	4.1%	2.3%	6.4%
1990	3,375	3,643	7,695	7,926	305	4.0%	3.0%	7.0%	12,830	12,454	479	3.7%	-2.9%	0.8%
1991	3,383	3,643	7,926	8,085	306	3.9%	2.0%	5.9%	12,454	12,325	467	3.8%	-1.0%	2.7%
1992	3,383	3,643	8,085	8,408	336	4.2%	4.0%	8.2%	12,325	12,457	497	4.0%	1.1%	5.1%
1993	3,383	3,643	8,408	8,997	434	5.2%	7.0%	12.2%	12,457	12,973	625	5.0%	4.1%	9.2%
1994	3,383	3,643	8,997	9,717	321	3.6%	8.0%	11.6%	12,973	13,645	451	3.5%	5.2%	8.7%
1995	3,383	3,643	9,717	10,611	386	4.0%	9.2%	13.2%	13,645	14,533	528	3.9%	6.5%	10.4%
1996	3,383	3,643	10,611	11,399	420	4.0%	7.4%	11.4%	14,533	15,109	557	3.8%	4.0%	7.8%
1997	3,383	3,643	11,399	12,197	392	3.4%	7.0%	10.4%	15,109	15,896	510	3.4%	5.2%	8.6%
1998	3,369	3,643	12,197	11,417	329	2.7%	-6.4%	-3.7%	15,896	14,644	422	2.7%	-7.9%	-5.2%
1999	3,369	3,643	11,417	11,074	449	3.9%	-3.0%	0.9%	14,644	13,833	561	3.8%	-5.5%	-1.7%
2000	3,369	3,643	11,074	11,431	361	3.3%	3.2%	6.5%	13,833	13,811	436	3.2%	-0.2%	3.0%
2001	3,368	3,643	11,431	11,580	358	3.1%	1.3%	4.4%	13,811	13,777	426	3.1%	-0.2%	2.8%
2002	3,369	3,643	11,580	12,103	330	2.9%	4.5%	7.4%	13,777	14,066	384	2.8%	2.1%	4.9%
2003	3,369	3,643	12,103	13,000	405	3.3%	7.4%	10.8%	14,066	14,829	462	3.3%	5.4%	8.7%
2004	3,368	3,643	13,000	15,210	607	4.7%	17.0%	21.7%	14,829	16,803	670	4.5%	13.3%	17.8%
2005	3,369	3,643	15,210	16,631	500	3.3%	9.3%	12.6%	16,803	17,766	534	3.2%	5.7%	8.9%
2006	3,389	3,643	16,631	17,296	495	3.0%	4.0%	7.0%	17,766	18,019	516	2.9%	1.4%	4.3%
2007	3,389	3,643	17,296	20,064	495	2.9%	16.0%	18.9%	18,019	20,082	495	2.7%	11.5%	14.2%
2008	3,380	3,632	20,064	21,669	878	4.4%	8.0%	12.4%	20,082	21,669	878	4.4%	7.9%	12.3%

Figure A.4. Campbell Farm Nominal and Real Estimated Value per Acre.

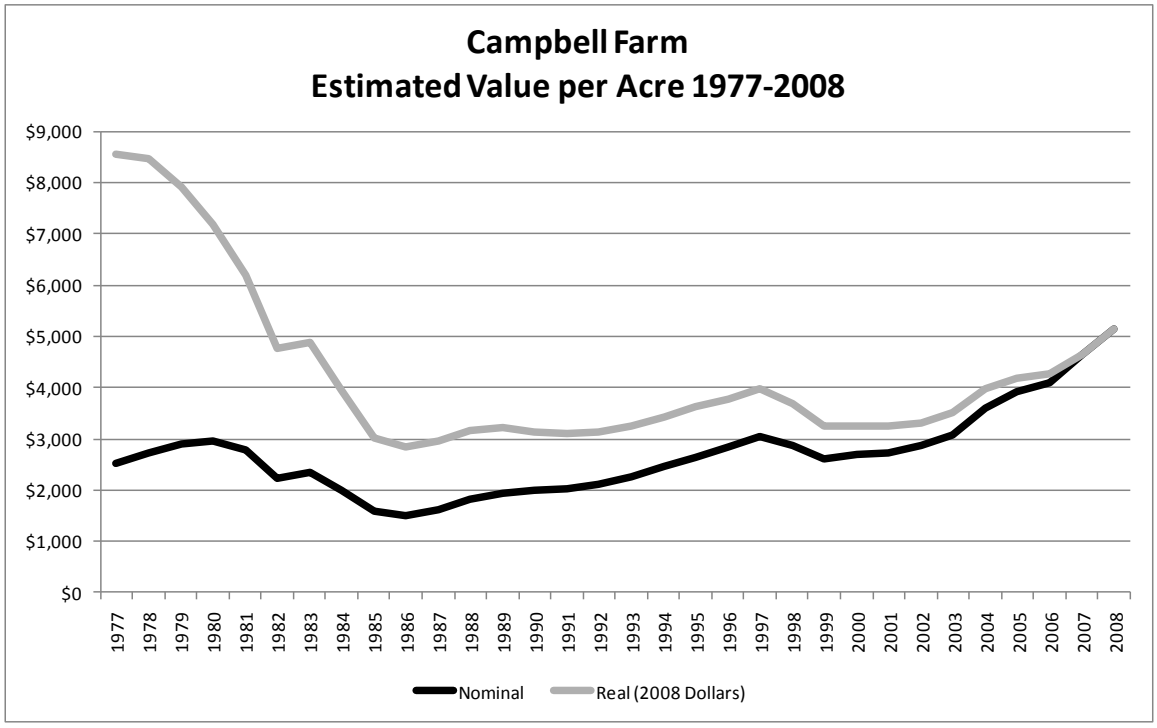


Figure A.5. Campbell Farm Nominal and Real Cash Return.

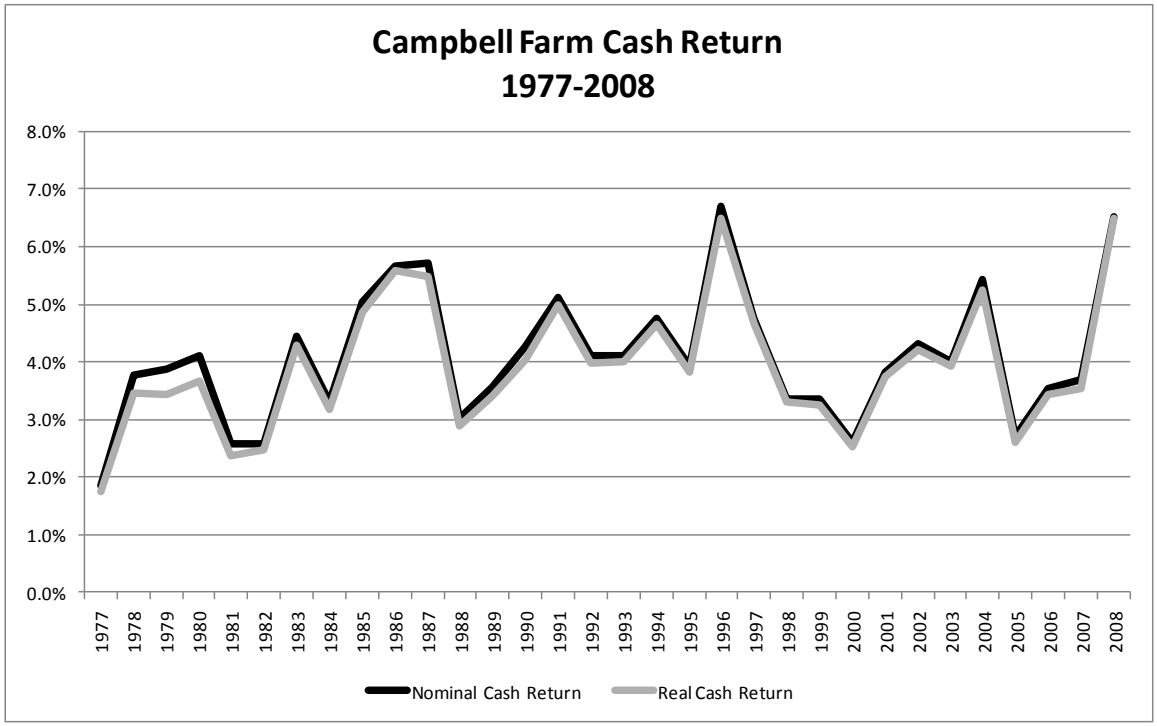


Figure A.6. Campbell Farm Nominal and Real Changes in Land Value.

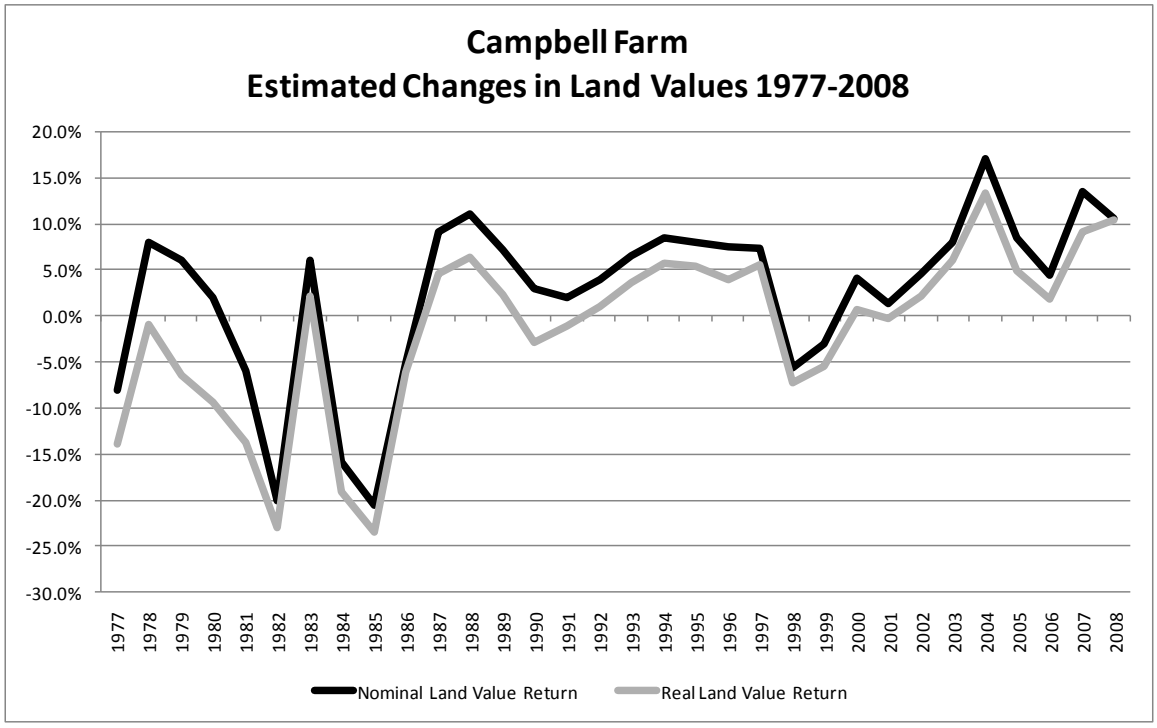


Table A.2. Campbell Farm Financial Data (all dollar amounts are in thousands).

Campbell Farm

Crop Year	Tillable Acres	Total Acres	Beginning of Year Asset Value	End of Year Asset Value	Net Income	Nominal Cash Return	Nominal Land Value Change	Nominal Total Return	Beginning of Year Asset Value (2008 Dollars)	End of Year Asset Value (2008 Dollars)	Net Income (2008 Dollars)	Real Cash Return	Real Land Value Change	Real Total Return
1977	77	80	$ 220	$ 202	$ 4	1.9%	-8.1%	-6.3%	$ 795	$ 684	$ 14	1.7%	-13.9%	-12.2%
1978	77	80	202	218	8	3.8%	8.0%	11.8%	684	678	24	3.5%	-0.9%	2.5%
1979	77	80	218	231	8	3.9%	6.0%	9.9%	678	634	23	3.4%	-6.4%	-3.0%
1980	77	80	231	236	10	4.1%	2.0%	6.1%	634	575	23	3.7%	-9.3%	-5.7%
1981	77	80	236	222	6	2.6%	-6.0%	-3.4%	575	496	14	2.4%	-13.7%	-11.3%
1982	77	80	222	177	6	2.6%	-20.0%	-17.4%	496	382	12	2.5%	-23.0%	-20.5%
1983	77	80	177	188	8	4.5%	6.1%	10.6%	382	391	16	4.3%	2.2%	6.5%
1984	77	80	188	158	6	3.3%	-15.9%	-12.6%	391	316	12	3.2%	-19.1%	-15.9%
1985	80	80	158	126	8	5.0%	-20.6%	-15.6%	316	242	15	4.8%	-23.5%	-18.7%
1986	80	80	126	119	7	5.7%	-5.1%	0.6%	242	227	14	5.6%	-6.1%	-0.5%
1987	80	80	119	130	7	5.7%	9.2%	14.9%	227	237	12	5.5%	4.6%	10.0%
1988	80	80	130	145	4	3.0%	11.1%	14.1%	237	253	7	2.9%	6.4%	9.3%
1989	80	80	145	155	5	3.6%	7.1%	10.7%	253	258	9	3.4%	2.3%	5.7%
1990	80	80	155	160	7	4.3%	3.0%	7.3%	258	251	10	4.0%	-2.9%	1.1%
1991	80	80	160	163	8	5.1%	2.0%	7.1%	251	248	12	5.0%	-1.0%	3.9%
1992	80	80	163	169	7	4.1%	4.0%	8.1%	248	251	10	4.0%	1.1%	5.1%
1993	80	80	169	180	7	4.1%	6.5%	10.6%	251	260	10	4.0%	3.7%	7.7%
1994	80	80	180	196	9	4.8%	8.5%	13.2%	260	275	12	4.6%	5.6%	10.3%
1995	80	80	196	211	8	3.9%	8.0%	11.9%	275	290	11	3.8%	5.3%	9.2%
1996	80	80	211	227	14	6.7%	7.5%	14.2%	290	301	19	6.5%	4.0%	10.5%
1997	80	80	227	244	11	4.7%	7.3%	12.0%	301	318	14	4.7%	5.5%	10.2%
1998	80	80	244	230	8	3.3%	-5.7%	-2.4%	318	295	10	3.3%	-7.2%	-3.9%
1999	85	86	230	223	8	3.4%	-3.0%	0.4%	295	278	10	3.3%	-5.5%	-2.3%
2000	85	86	223	232	6	2.6%	4.1%	6.7%	278	280	7	2.5%	0.7%	3.2%
2001	85	86	232	235	9	3.8%	1.3%	5.1%	280	280	11	3.8%	-0.3%	3.5%
2002	85	86	235	246	10	4.3%	4.5%	8.8%	280	285	12	4.2%	2.1%	6.3%
2003	85	86	246	265	10	4.0%	8.0%	12.0%	285	303	11	3.9%	6.0%	9.9%
2004	85	86	265	310	14	5.4%	17.0%	22.4%	303	343	16	5.3%	13.3%	18.6%
2005	85	86	310	337	8	2.7%	8.5%	11.2%	343	360	9	2.6%	4.9%	7.5%
2006	85	86	337	352	12	3.5%	4.5%	8.0%	360	366	12	3.4%	1.9%	5.3%
2007	85	86	352	399	13	3.7%	13.5%	17.2%	366	400	13	3.5%	9.1%	12.6%
2008	85	86	399	441	26	6.5%	10.6%	17.1%	400	441	26	6.5%	10.5%	17.0%

Figure A.7. Carter-Pennell Farm Nominal and Real Estimated Value per Acre.

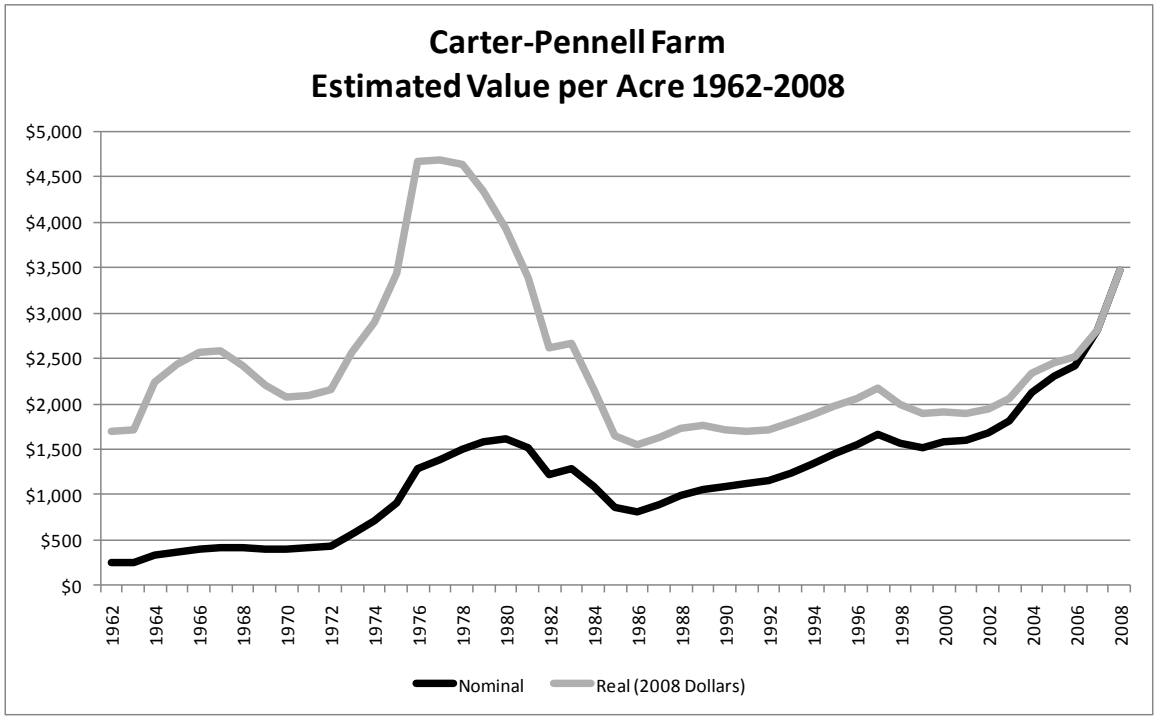


Figure A.8. Carter-Pennell Farm Nominal and Real Cash Return.

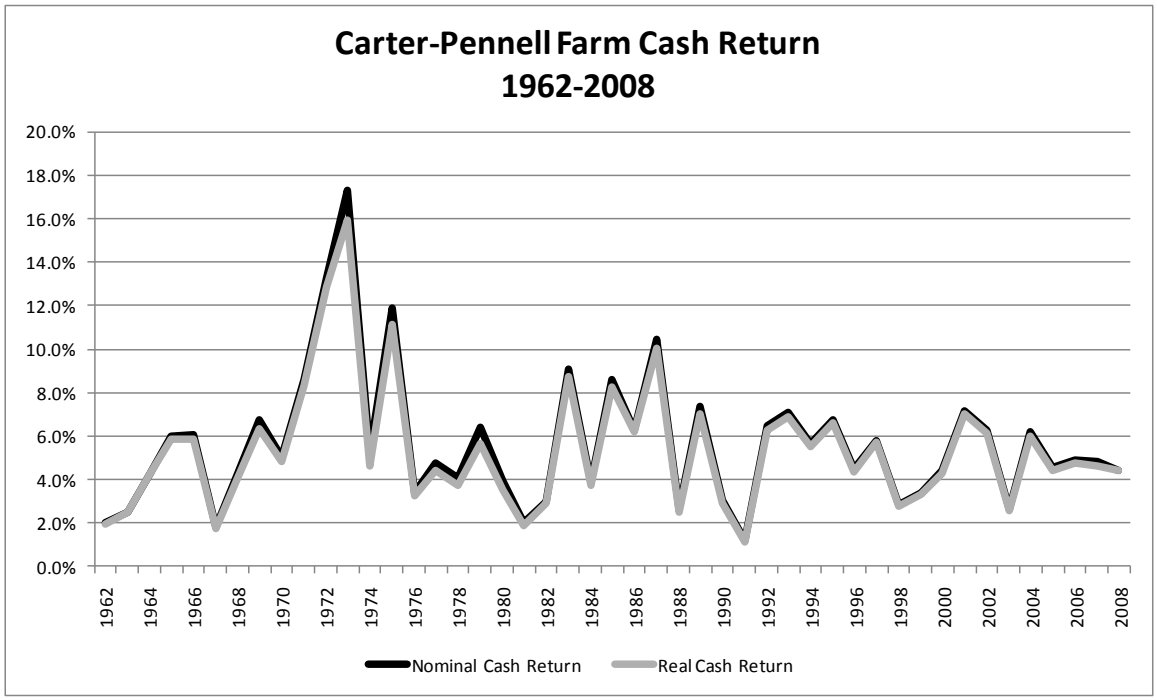


Figure A.9. Carter-Pennell Farm Nominal and Real Changes in Land Value.

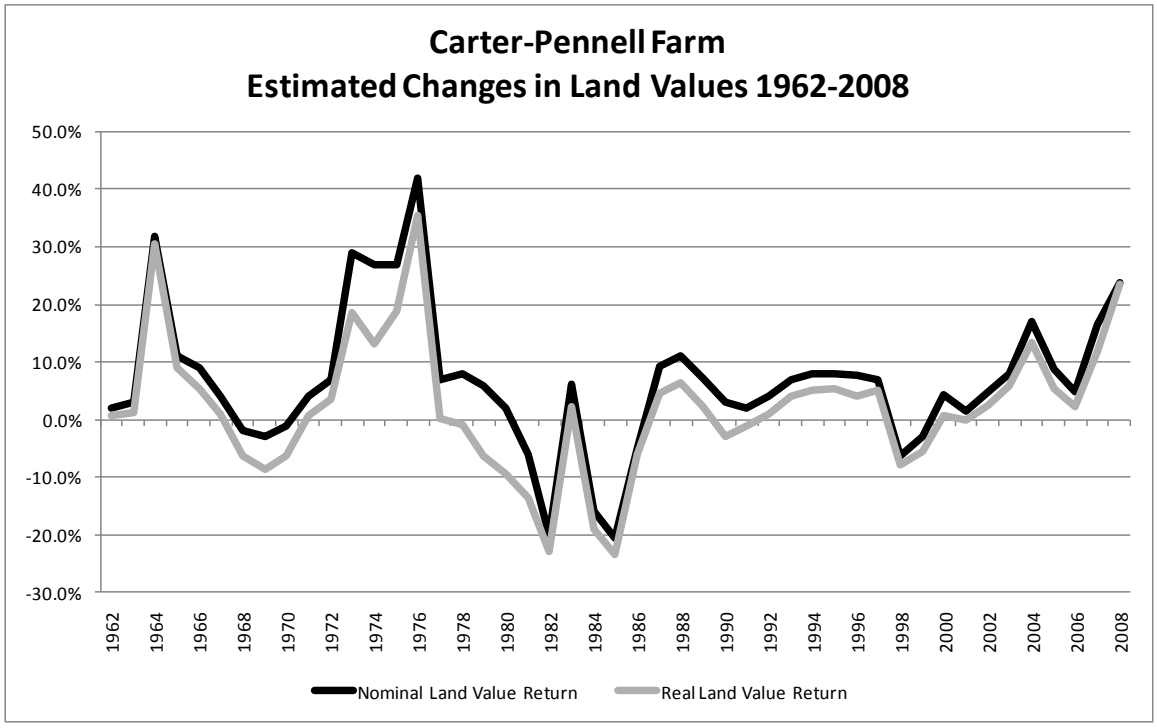


Table A.3. Carter-Pennell Farm Financial Data (all dollar amounts are in thousands).

Carter-Pennell Farm

Crop Year	Tillable Acres	Total Acres	Beginning of Year Asset Value	End of Year Asset Value	Net Income	Nominal Cash Return	Nominal Land Value Change	Nominal Total Return	Beginning of Year Asset Value (2008 Dollars)	End of Year Asset Value (2008 Dollars)	Net Income (2008 Dollars)	Real Cash Return	Real Land Value Change	Real Total Return
1962	297	346	$ 83	$ 85	$ 2	2.0%	2.0%	4.0%	$ 581	$ 584	$ 11	2.0%	0.7%	2.6%
1963	297	346	85	87	2	2.5%	3.0%	5.5%	584	592	14	2.5%	1.3%	3.8%
1964	297	346	87	115	4	4.3%	31.9%	36.2%	592	774	25	4.2%	30.6%	34.9%
1965	297	346	115	127	7	6.0%	11.0%	17.0%	774	842	45	5.9%	8.9%	14.8%
1966	297	346	127	139	8	6.1%	9.0%	15.1%	842	888	49	5.9%	5.4%	11.2%
1967	297	346	139	144	3	1.8%	4.0%	5.8%	888	896	16	1.8%	0.9%	2.7%
1968	297	346	144	142	6	4.3%	-2.0%	2.3%	896	838	37	4.1%	-6.4%	-2.3%
1969	297	346	142	137	10	6.7%	-3.0%	3.7%	838	766	53	6.3%	-8.7%	-2.3%
1970	297	346	137	136	7	5.1%	-1.0%	4.1%	766	718	37	4.8%	-6.2%	-1.4%
1971	297	346	136	141	12	8.6%	4.0%	12.6%	718	723	60	8.3%	0.7%	9.0%
1972	297	346	141	151	19	13.3%	7.0%	20.3%	723	748	93	12.8%	3.5%	16.3%
1973	297	346	151	195	26	17.3%	29.0%	46.3%	748	888	119	16.0%	18.7%	34.6%
1974	297	346	195	248	10	5.2%	27.0%	32.2%	888	1,004	41	4.6%	13.1%	17.7%
1975	297	346	248	315	29	11.9%	27.0%	38.9%	1,004	1,192	112	11.1%	18.8%	29.9%
1976	297	346	315	447	11	3.4%	42.0%	45.4%	1,192	1,614	39	3.3%	35.4%	38.7%
1977	303	346	447	478	21	4.7%	7.0%	11.7%	1,614	1,619	72	4.4%	0.3%	4.7%
1978	294	346	478	516	19	4.1%	8.0%	12.1%	1,619	1,604	60	3.7%	-0.9%	2.8%
1979	323	346	516	547	33	6.4%	6.0%	12.4%	1,604	1,501	91	5.7%	-6.4%	-0.8%
1980	323	346	547	558	22	3.9%	2.0%	5.9%	1,501	1,360	53	3.5%	-9.3%	-5.8%
1981	323	346	558	525	11	2.0%	-6.0%	-4.0%	1,360	1,174	25	1.9%	-13.7%	-11.8%
1982	323	346	525	420	16	3.0%	-20.0%	-17.0%	1,174	905	34	2.9%	-23.0%	-20.1%
1983	326	346	420	446	38	9.1%	6.1%	15.2%	905	925	79	8.8%	2.2%	11.0%
1984	326	346	446	375	17	3.8%	-15.9%	-12.1%	925	748	34	3.7%	-19.1%	-15.4%
1985	321	346	375	298	32	8.6%	-20.6%	-12.0%	748	572	62	8.3%	-23.5%	-15.2%
1986	321	346	298	282	19	6.3%	-5.1%	1.2%	572	537	35	6.2%	-6.1%	0.1%
1987	321	346	282	308	30	10.5%	9.2%	19.7%	537	562	54	10.0%	4.6%	14.6%
1988	321	346	308	343	8	2.6%	11.1%	13.7%	562	598	14	2.5%	6.4%	8.9%
1989	321	346	343	367	25	7.4%	7.1%	14.5%	598	612	42	7.0%	2.3%	9.4%
1990	321	346	367	378	11	3.0%	3.0%	6.0%	612	594	18	2.9%	-2.9%	-0.1%
1991	321	346	378	385	4	1.2%	2.0%	3.2%	594	588	7	1.1%	-1.0%	0.1%
1992	321	346	385	401	25	6.5%	4.0%	10.5%	588	594	37	6.3%	1.1%	7.4%
1993	321	346	401	429	28	7.1%	7.0%	14.1%	594	618	41	6.9%	4.1%	11.0%
1994	321	346	429	463	24	5.6%	8.0%	13.6%	618	651	34	5.5%	5.2%	10.7%
1995	321	346	463	500	31	6.8%	8.0%	14.8%	651	685	43	6.6%	5.3%	11.9%
1996	321	346	500	538	22	4.5%	7.6%	12.1%	685	714	30	4.3%	4.2%	8.5%
1997	321	346	538	576	31	5.8%	7.0%	12.8%	714	751	41	5.7%	5.2%	10.9%
1998	321	346	576	539	16	2.8%	-6.4%	-3.6%	751	692	21	2.8%	-7.9%	-5.1%
1999	321	346	539	523	18	3.4%	-3.0%	0.4%	692	653	23	3.3%	-5.5%	-2.2%
2000	321	346	523	545	23	4.4%	4.2%	8.7%	653	659	28	4.3%	0.8%	5.1%
2001	321	346	545	553	39	7.2%	1.4%	8.5%	659	658	46	7.0%	-0.2%	6.9%
2002	321	346	553	579	35	6.3%	4.8%	11.1%	658	673	40	6.1%	2.4%	8.5%
2003	321	346	579	626	15	2.6%	8.0%	10.6%	673	714	17	2.6%	6.0%	8.6%
2004	321	346	626	732	39	6.2%	17.0%	23.2%	714	809	43	6.0%	13.3%	19.3%
2005	321	346	732	797	33	4.6%	8.8%	13.4%	809	851	36	4.4%	5.2%	9.6%
2006	319	346	797	835	39	4.9%	4.8%	9.7%	851	870	41	4.8%	2.2%	7.0%
2007	319	346	835	973	40	4.8%	16.4%	21.2%	870	974	40	4.6%	11.9%	16.5%
2008	319	346	973	1,203	43	4.4%	23.7%	28.2%	974	1,203	43	4.4%	23.6%	28.1%

Figure A.10. DeHart Farm Nominal and Real Estimated Value per Acre.

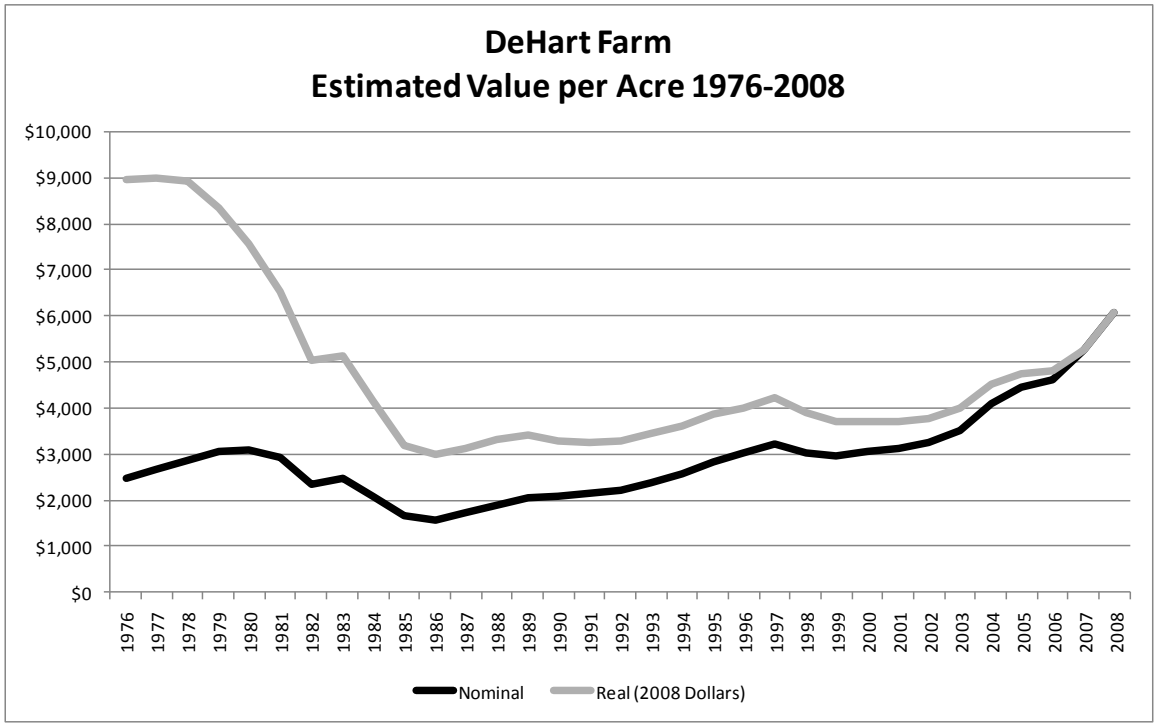


Figure A.11. DeHart Farm Nominal and Real Cash Return.

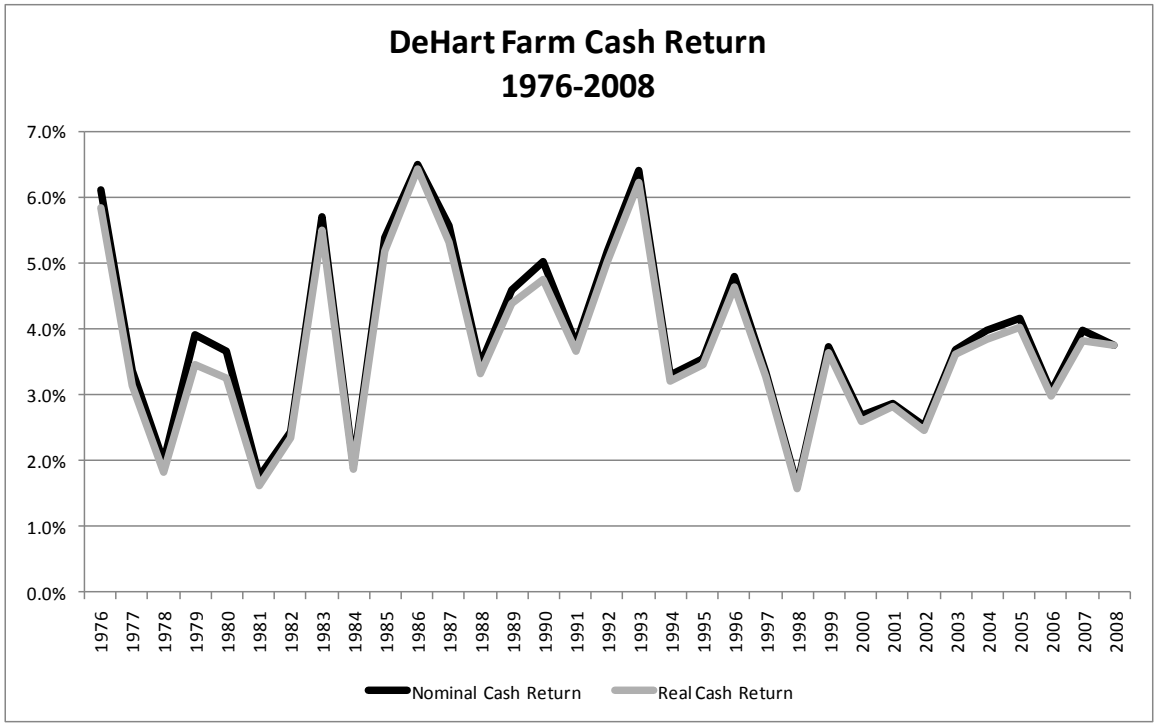


Figure A.12. DeHart Farm Nominal and Real Changes in Land Value.

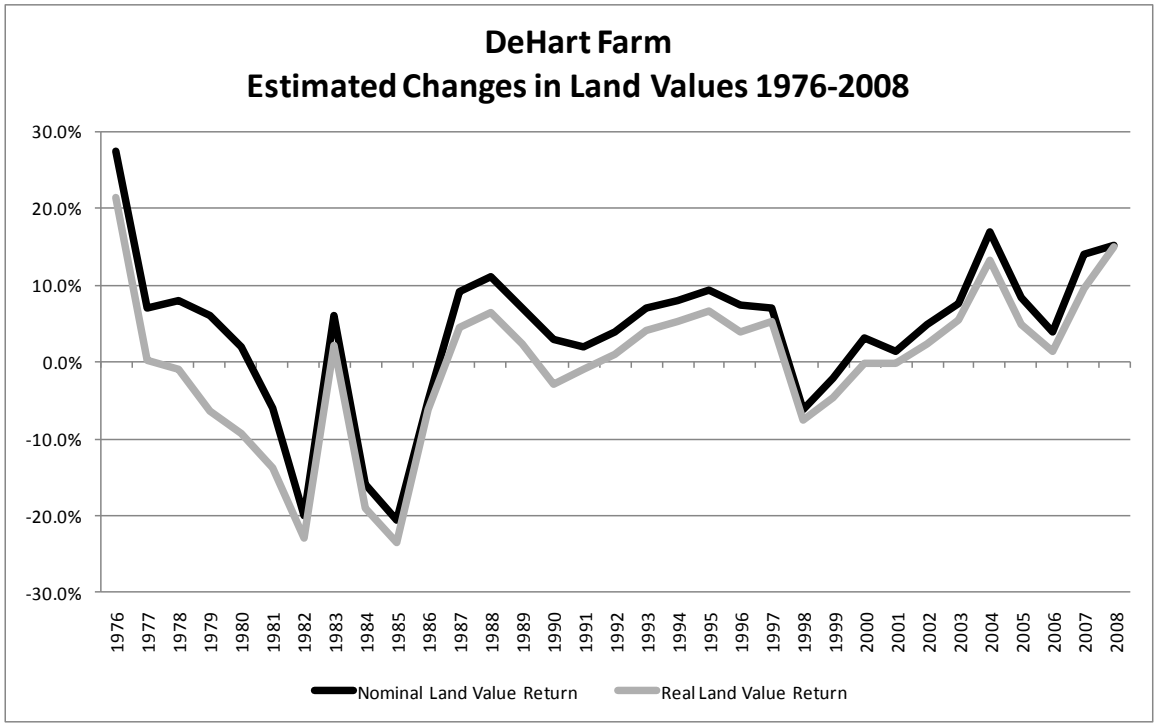


Table A.4. DeHart Farm Financial Data (all dollars are in thousands).

DeHart Farm

Crop Year	Tillable Acres	Total Acres	Beginning of Year Asset Value	End of Year Asset Value	Net Income	Nominal Cash Return	Nominal Land Value Change	Nominal Total Return	Beginning of Year Asset Value (2008 Dollars)	End of Year Asset Value (2008 Dollars)	Net Income (2008 Dollars)	Real Cash Return	Real Land Value Change	Real Total Return
1976	114	120	$234	$298	$14	6.1%	27.4%	33.5%	$ 886	$ 1,077	$ 52	5.8%	21.5%	27.3%
1977	114	120	298	319	10	3.4%	7.0%	10.4%	1,077	1,080	34	3.1%	0.3%	3.4%
1978	116	120	319	344	6	2.0%	8.0%	10.0%	1,080	1,070	20	1.8%	-0.9%	0.9%
1979	116	120	344	365	13	3.9%	6.0%	9.9%	1,070	1,001	37	3.5%	-6.4%	-3.0%
1980	116	120	365	372	13	3.7%	2.0%	5.7%	1,001	907	33	3.2%	-9.3%	-6.1%
1981	116	120	372	350	7	1.8%	-6.0%	-4.2%	907	783	15	1.6%	-13.7%	-12.1%
1982	116	120	350	280	9	2.4%	-20.0%	-17.6%	783	603	18	2.4%	-23.0%	-20.6%
1983	116	120	280	297	16	5.7%	6.1%	11.8%	603	617	33	5.5%	2.2%	7.7%
1984	116	120	297	250	6	1.9%	-15.9%	-14.0%	617	499	11	1.9%	-19.1%	-17.2%
1985	116	120	250	198	13	5.4%	-20.6%	-15.2%	499	382	26	5.2%	-23.5%	-18.3%
1986	116	120	198	188	13	6.5%	-5.1%	1.4%	382	358	25	6.4%	-6.1%	0.3%
1987	116	120	188	206	10	5.6%	9.2%	14.8%	358	375	19	5.3%	4.6%	9.9%
1988	116	120	206	228	7	3.5%	11.1%	14.6%	375	399	12	3.3%	6.4%	9.7%
1989	116	120	228	245	11	4.6%	7.1%	11.7%	399	408	18	4.4%	2.3%	6.7%
1990	116	120	245	252	12	5.0%	3.0%	8.0%	408	396	19	4.7%	-2.9%	1.8%
1991	116	120	252	257	10	3.8%	2.0%	5.8%	396	392	15	3.7%	-1.0%	2.6%
1992	116	120	257	267	13	5.2%	4.0%	9.2%	392	396	20	5.0%	1.1%	6.1%
1993	116	120	267	286	17	6.4%	7.0%	13.4%	396	412	25	6.2%	4.1%	10.4%
1994	116	120	286	309	9	3.3%	8.0%	11.3%	412	434	13	3.2%	5.2%	8.4%
1995	116	120	309	338	11	3.6%	9.4%	12.9%	434	463	15	3.5%	6.7%	10.1%
1996	116	120	338	363	16	4.8%	7.4%	12.2%	463	481	21	4.6%	3.9%	8.6%
1997	116	120	363	388	12	3.3%	7.0%	10.3%	481	506	16	3.3%	5.2%	8.5%
1998	116	120	388	364	6	1.6%	-6.2%	-4.6%	506	467	8	1.6%	-7.7%	-6.1%
1999	116	120	364	357	14	3.7%	-2.1%	1.6%	467	445	17	3.6%	-4.7%	-1.1%
2000	116	120	357	368	10	2.7%	3.2%	5.9%	445	445	12	2.6%	-0.2%	2.4%
2001	116	120	368	373	11	2.9%	1.3%	4.2%	445	444	13	2.8%	-0.2%	2.6%
2002	116	120	373	391	9	2.5%	4.8%	7.3%	444	454	11	2.5%	2.4%	4.8%
2003	116	120	391	420	14	3.7%	7.5%	11.2%	454	479	16	3.6%	5.5%	9.2%
2004	116	120	420	492	17	4.0%	17.0%	21.0%	479	543	18	3.8%	13.3%	17.2%
2005	116	120	492	533	20	4.2%	8.5%	12.6%	543	570	22	4.0%	4.9%	8.9%
2006	116	120	533	555	16	3.0%	4.0%	7.0%	570	578	17	3.0%	1.4%	4.4%
2007	116	120	555	633	22	4.0%	14.1%	18.1%	578	633	22	3.8%	9.6%	13.4%
2008	116	120	633	729	24	3.7%	15.2%	18.9%	633	729	24	3.7%	15.1%	18.8%

Figure A.13. Hackett Farm Nominal and Real Estimated Value per Acre.

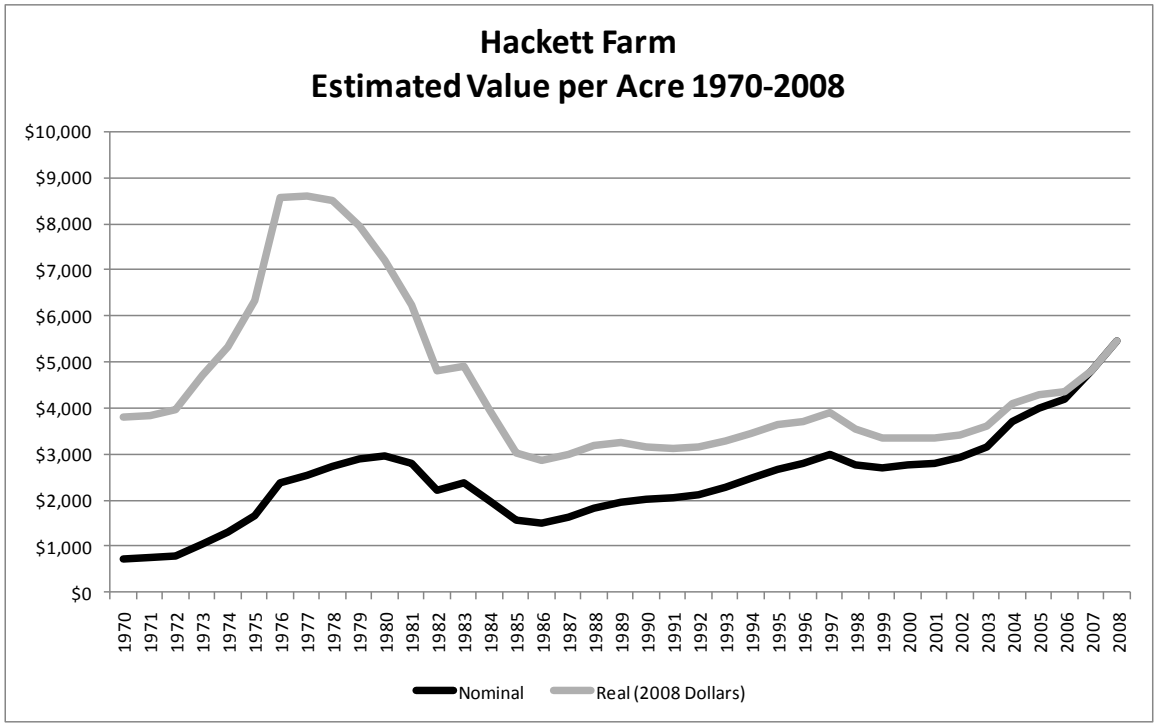


Figure A.14. Hackett Farm Nominal and Real Cash Return.

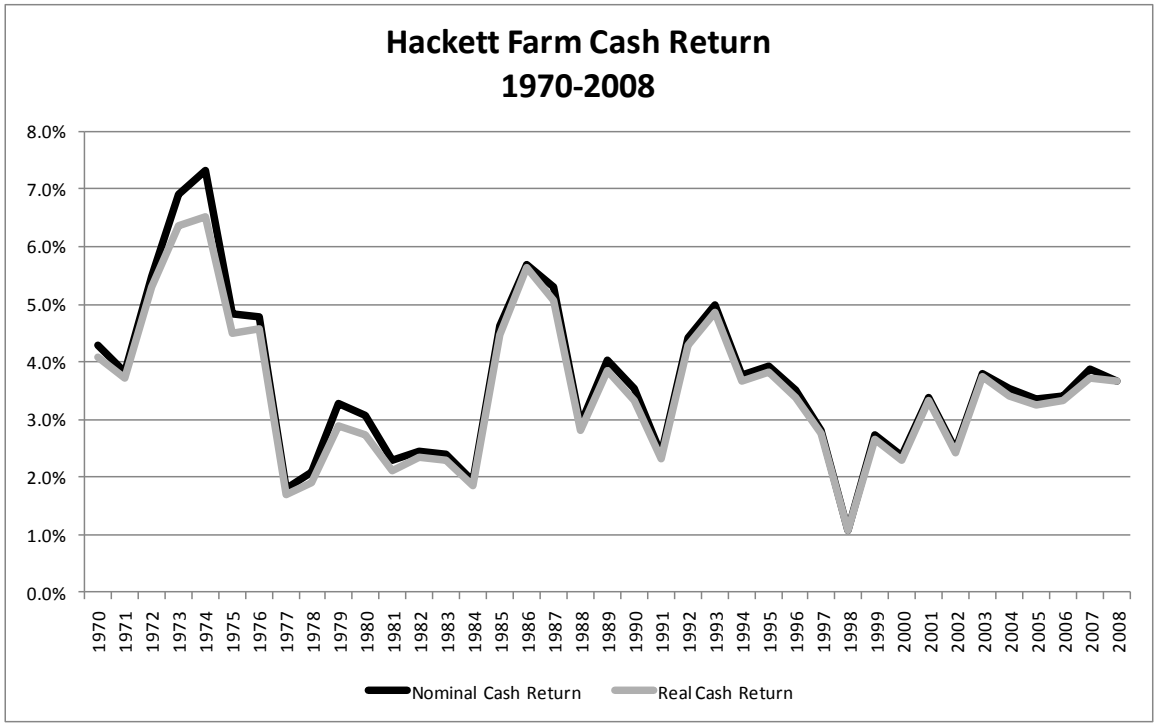


Figure A.15. Hackett Farm Nominal and Real Changes in Land Value.

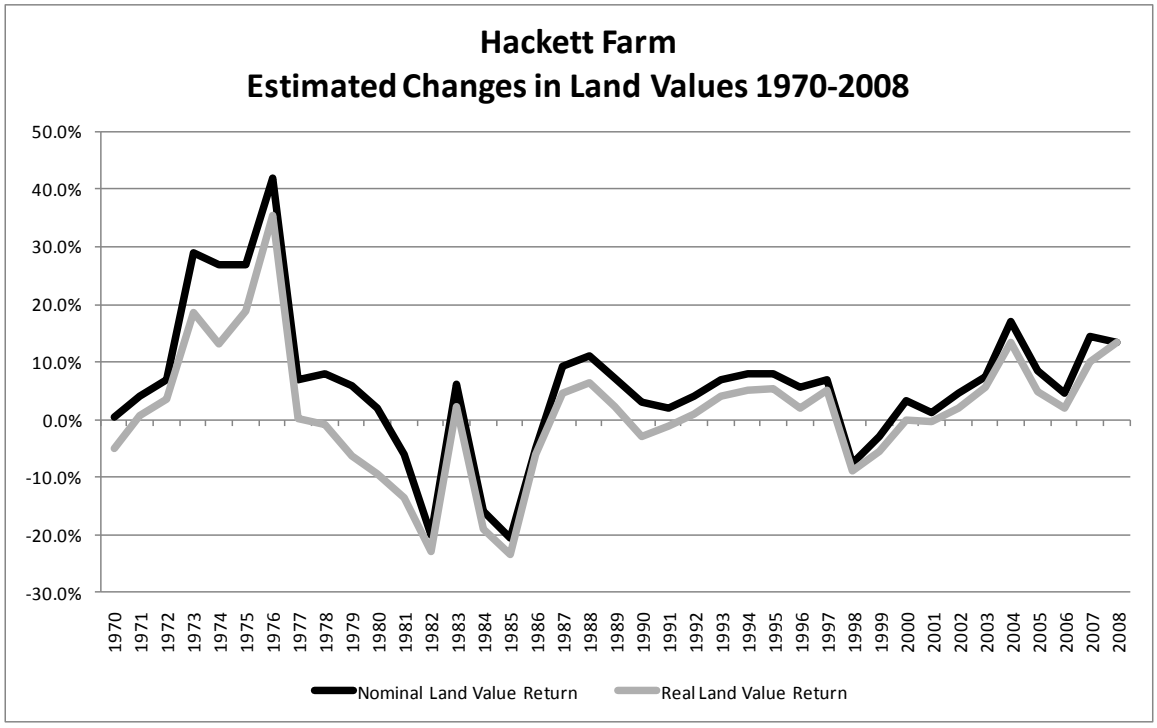


Table A.5. Hackett Farm Financial Data (all dollars are in thousands).

Hackett Farm

Crop Year	Tillable Acres	Total Acres	Beginning of Year Asset Value	End of Year Asset Value	Net Income	Nominal Cash Return	Nominal Land Value Change	Nominal Total Return	Beginning of Year Asset Value (2008 Dollars)	End of Year Asset Value (2008 Dollars)	Net Income (2008 Dollars)	Real Cash Return	Real Land Value Change	Real Total Return
1970	342	416	$ 299	$ 300	$ 13	4.3%	0.3%	4.6%	$ 1,668	$ 1,586	$ 68	4.1%	-5.0%	-0.9%
1971	350	416	300	312	11	3.8%	4.0%	7.8%	1,586	1,597	59	3.7%	0.7%	4.4%
1972	350	416	312	334	17	5.5%	7.0%	12.5%	1,597	1,652	85	5.3%	3.5%	8.8%
1973	350	416	334	431	23	6.9%	29.0%	35.9%	1,652	1,961	105	6.4%	18.7%	25.0%
1974	350	416	431	547	32	7.3%	27.0%	34.3%	1,961	2,217	128	6.5%	13.1%	19.6%
1975	353	416	547	695	26	4.8%	27.0%	31.8%	2,217	2,633	100	4.5%	18.8%	23.3%
1976	352	416	695	987	33	4.8%	42.0%	46.8%	2,633	3,565	120	4.6%	35.4%	40.0%
1977	352	416	987	1,056	18	1.8%	7.0%	8.8%	3,565	3,575	60	1.7%	0.3%	2.0%
1978	352	416	1,056	1,141	22	2.1%	8.0%	10.1%	3,575	3,542	68	1.9%	-0.9%	1.0%
1979	352	416	1,141	1,209	37	3.3%	6.0%	9.3%	3,542	3,314	102	2.9%	-6.4%	-3.5%
1980	353	416	1,209	1,233	37	3.1%	2.0%	5.1%	3,314	3,004	90	2.7%	-9.3%	-6.6%
1981	353	416	1,233	1,159	28	2.3%	-6.0%	-3.7%	3,004	2,592	63	2.1%	-13.7%	-11.6%
1982	353	416	1,159	927	28	2.4%	-20.0%	-17.6%	2,592	1,997	61	2.3%	-23.0%	-20.6%
1983	356	416	927	984	22	2.4%	6.1%	8.5%	1,997	2,042	46	2.3%	2.2%	4.5%
1984	356	416	984	827	19	1.9%	-15.9%	-14.0%	2,042	1,652	38	1.9%	-19.1%	-17.2%
1985	356	416	827	657	38	4.6%	-20.6%	-16.0%	1,652	1,264	74	4.5%	-23.5%	-19.0%
1986	356	416	657	623	37	5.7%	-5.1%	0.6%	1,264	1,186	71	5.6%	-6.1%	-0.5%
1987	356	416	623	681	33	5.3%	9.2%	14.5%	1,186	1,240	60	5.1%	4.6%	9.6%
1988	356	416	681	756	20	2.9%	11.1%	14.0%	1,240	1,320	35	2.8%	6.4%	9.2%
1989	356	415	756	810	30	4.0%	7.1%	11.1%	1,320	1,351	51	3.8%	2.3%	6.2%
1990	356	416	810	834	29	3.5%	3.0%	6.5%	1,351	1,311	45	3.3%	-2.9%	0.4%
1991	356	416	834	851	20	2.4%	2.0%	4.4%	1,311	1,298	30	2.3%	-1.0%	1.3%
1992	356	416	851	885	38	4.4%	4.0%	8.4%	1,298	1,311	56	4.3%	1.1%	5.4%
1993	356	416	885	947	44	5.0%	7.0%	12.0%	1,311	1,366	64	4.9%	4.1%	9.0%
1994	356	416	947	1,023	36	3.8%	8.0%	11.8%	1,366	1,436	50	3.7%	5.2%	8.9%
1995	356	416	1,023	1,105	40	3.9%	8.0%	11.9%	1,436	1,513	55	3.8%	5.3%	9.1%
1996	356	416	1,105	1,166	39	3.5%	5.5%	9.0%	1,513	1,545	51	3.4%	2.1%	5.5%
1997	356	416	1,166	1,247	33	2.8%	7.0%	9.8%	1,545	1,625	43	2.8%	5.2%	8.0%
1998	356	416	1,247	1,154	13	1.1%	-7.5%	-6.4%	1,625	1,480	17	1.1%	-9.0%	-7.9%
1999	356	416	1,154	1,119	31	2.7%	-3.0%	-0.3%	1,480	1,398	39	2.7%	-5.5%	-2.9%
2000	356	416	1,119	1,155	26	2.4%	3.2%	5.6%	1,398	1,395	32	2.3%	-0.2%	2.1%
2001	356	416	1,155	1,170	39	3.4%	1.3%	4.7%	1,395	1,392	46	3.3%	-0.3%	3.1%
2002	356	416	1,170	1,223	29	2.5%	4.5%	7.0%	1,392	1,421	34	2.4%	2.1%	4.5%
2003	356	416	1,223	1,315	47	3.8%	7.5%	11.3%	1,421	1,499	53	3.7%	5.5%	9.3%
2004	356	416	1,315	1,538	46	3.5%	17.0%	20.5%	1,499	1,699	51	3.4%	13.3%	16.7%
2005	356	416	1,538	1,668	52	3.4%	8.5%	11.8%	1,699	1,782	55	3.2%	4.9%	8.1%
2006	365	416	1,668	1,743	57	3.4%	4.5%	7.9%	1,782	1,816	59	3.3%	1.9%	5.2%
2007	365	416	1,743	1,997	68	3.9%	14.6%	18.4%	1,816	1,999	68	3.7%	10.1%	13.8%
2008	365	416	1,997	2,266	73	3.7%	13.5%	17.1%	1,999	2,266	73	3.7%	13.4%	17.0%

Figure A.16. Hubbell Farm Nominal and Real Estimated Value per Acre.

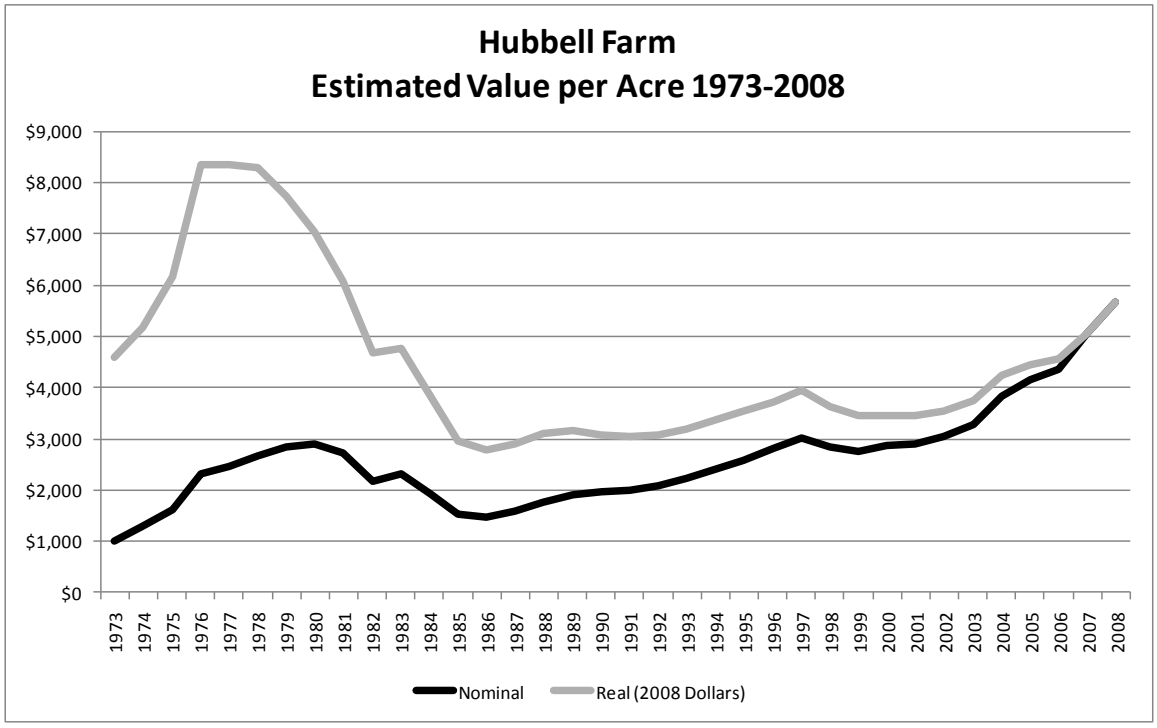


Figure A.17. Hubbell Farm Nominal and Real Cash Return.

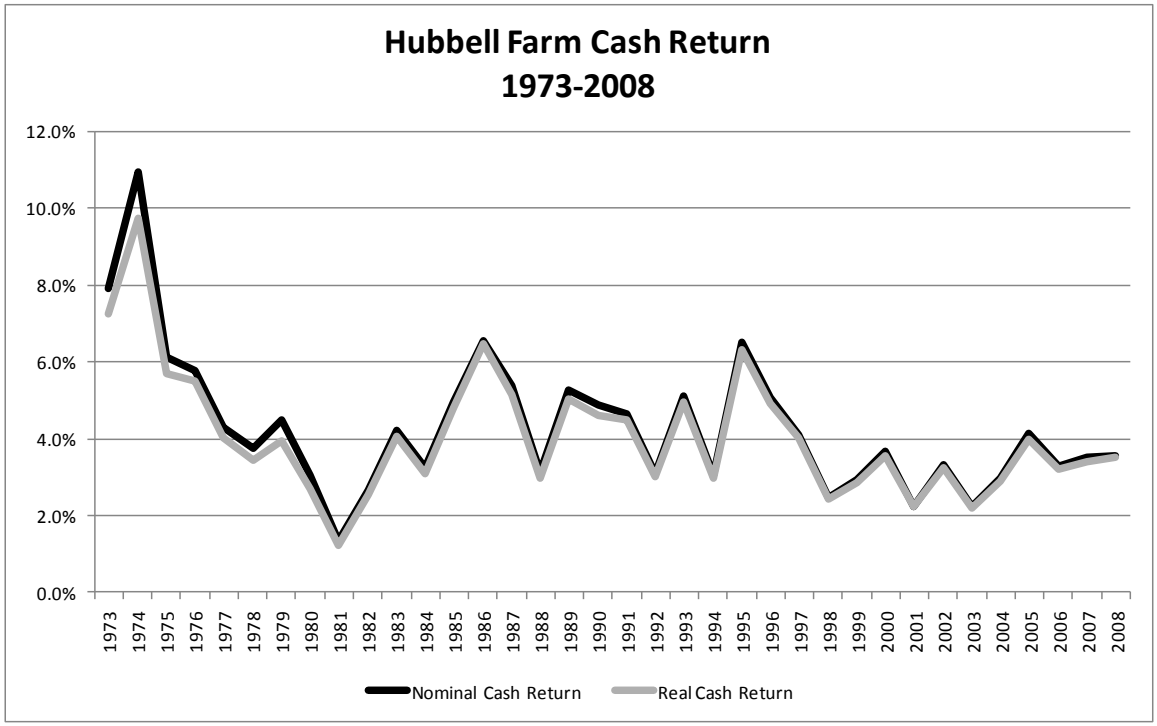


Figure A.18. Hubbell Farm Nominal and Real Changes in Land Value.

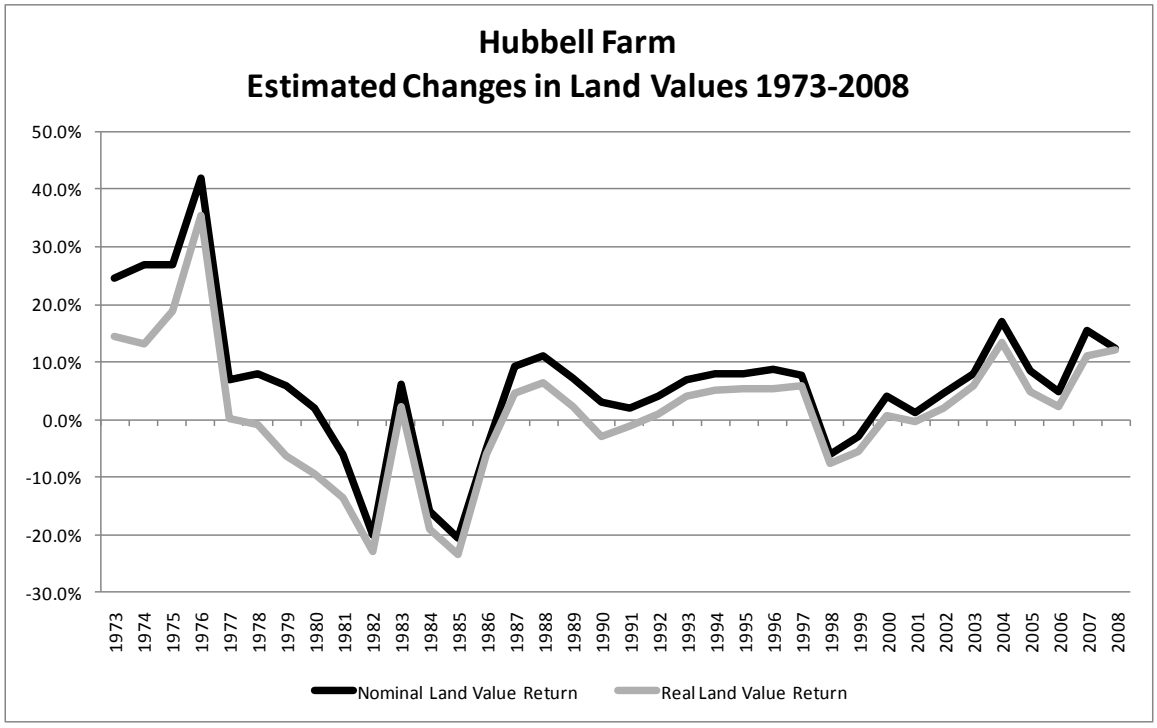


Table A.6. Hubbell Farm Financial Data (all dollars are in thousands).

Hubbell Farm

Crop Year	Tillable Acres	Total Acres	Beginning of Year Asset Value	End of Year Asset Value	Net Income	Nominal Cash Return	Nominal Land Value Change	Nominal Total Return	Beginning of Year Asset Value (2008 Dollars)	End of Year Asset Value (2008 Dollars)	Net Income (2008 Dollars)	Real Cash Return	Real Land Value Change	Real Total Return
1973	150	160	$ 130	$ 161	$ 10	7.9%	24.5%	32.4%	$ 641	$ 734	$ 47	7.3%	14.5%	21.8%
1974	150	160	161	205	18	10.9%	27.0%	37.9%	734	830	72	9.7%	13.1%	22.8%
1975	150	160	205	260	13	6.1%	27.0%	33.1%	830	986	47	5.7%	18.8%	24.5%
1976	150	160	260	370	15	5.8%	42.0%	47.8%	986	1,335	54	5.5%	35.4%	40.9%
1977	150	160	370	395	16	4.3%	7.0%	11.3%	1,335	1,338	54	4.0%	0.3%	4.3%
1978	152	160	395	427	15	3.8%	8.0%	11.8%	1,338	1,326	46	3.4%	-0.9%	2.5%
1979	152	160	427	453	19	4.5%	6.0%	10.5%	1,326	1,241	52	3.9%	-6.4%	-2.5%
1980	152	160	453	462	14	3.0%	2.0%	5.0%	1,241	1,125	34	2.7%	-9.3%	-6.6%
1981	152	160	462	434	6	1.3%	-6.0%	-4.7%	1,125	971	14	1.2%	-13.7%	-12.5%
1982	153	160	434	347	12	2.7%	-20.0%	-17.3%	971	748	25	2.6%	-23.0%	-20.4%
1983	152	160	347	368	15	4.2%	6.1%	10.3%	748	764	30	4.0%	2.2%	6.3%
1984	152	160	368	310	12	3.2%	-15.9%	-12.7%	764	618	24	3.1%	-19.1%	-16.0%
1985	152	160	310	246	15	5.0%	-20.6%	-15.6%	618	473	30	4.8%	-23.5%	-18.7%
1986	152	160	246	233	16	6.6%	-5.1%	1.5%	473	444	31	6.5%	-6.1%	0.3%
1987	152	160	233	255	13	5.4%	9.2%	14.6%	444	464	23	5.2%	4.6%	9.7%
1988	153	160	255	283	8	3.1%	11.1%	14.2%	464	494	14	3.0%	6.4%	9.4%
1989	153	160	283	303	15	5.2%	7.1%	12.3%	494	506	25	5.0%	2.3%	7.4%
1990	153	160	303	312	15	4.9%	3.0%	7.9%	506	491	23	4.6%	-2.9%	1.7%
1991	153	160	312	319	14	4.6%	2.0%	6.6%	491	486	22	4.5%	-1.0%	3.5%
1992	153	160	319	331	10	3.1%	4.0%	7.1%	486	491	15	3.0%	1.1%	4.1%
1993	153	160	331	355	17	5.1%	7.0%	12.1%	491	511	24	5.0%	4.1%	9.1%
1994	153	160	355	383	11	3.0%	8.0%	11.0%	511	538	15	3.0%	5.2%	8.1%
1995	153	160	383	414	25	6.5%	8.0%	14.5%	538	566	34	6.3%	5.3%	11.7%
1996	153	160	414	450	21	5.1%	8.8%	13.8%	566	596	28	4.9%	5.3%	10.2%
1997	153	160	450	484	18	4.1%	7.6%	11.7%	596	631	24	4.0%	5.8%	9.8%
1998	153	160	484	454	12	2.5%	-6.2%	-3.7%	631	582	15	2.4%	-7.7%	-5.2%
1999	153	160	454	440	13	2.9%	-3.0%	-0.1%	582	550	17	2.8%	-5.5%	-2.7%
2000	153	160	440	459	16	3.7%	4.1%	7.8%	550	554	20	3.6%	0.7%	4.3%
2001	153	160	459	465	10	2.2%	1.3%	3.5%	554	553	12	2.2%	-0.3%	2.0%
2002	153	160	465	486	15	3.3%	4.5%	7.8%	553	564	18	3.2%	2.1%	5.3%
2003	153	160	486	524	11	2.2%	8.0%	10.2%	564	598	12	2.2%	6.0%	8.2%
2004	153	160	524	614	16	3.0%	17.0%	20.0%	598	678	17	2.9%	13.3%	16.2%
2005	153	160	614	666	25	4.1%	8.5%	12.6%	678	711	27	4.0%	4.9%	8.9%
2006	157	160	666	699	22	3.3%	5.0%	8.2%	711	728	23	3.2%	2.4%	5.5%
2007	157	160	699	807	25	3.5%	15.5%	19.0%	728	808	25	3.4%	11.0%	14.4%
2008	157	160	807	906	29	3.5%	12.3%	15.8%	808	906	29	3.5%	12.2%	15.7%

Figure A.19. Hunter Research Farm Nominal and Real Estimated Value per Acre.

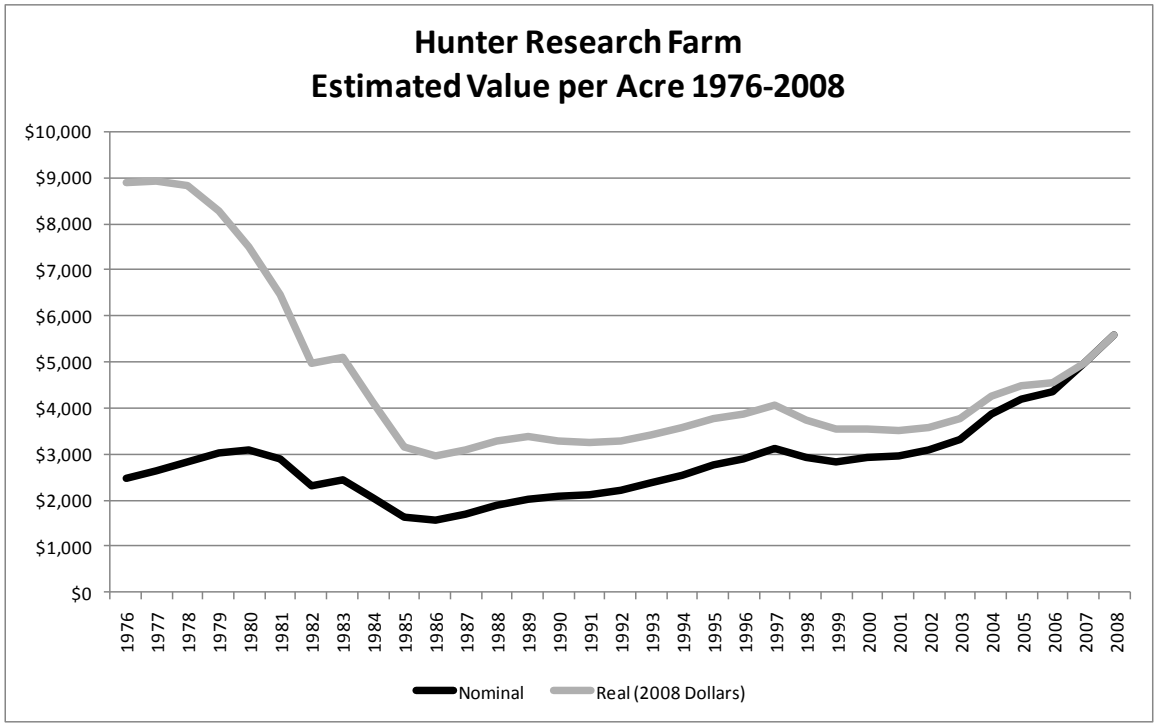


Figure A.20. Hunter Research Farm Nominal and Real Cash Return.

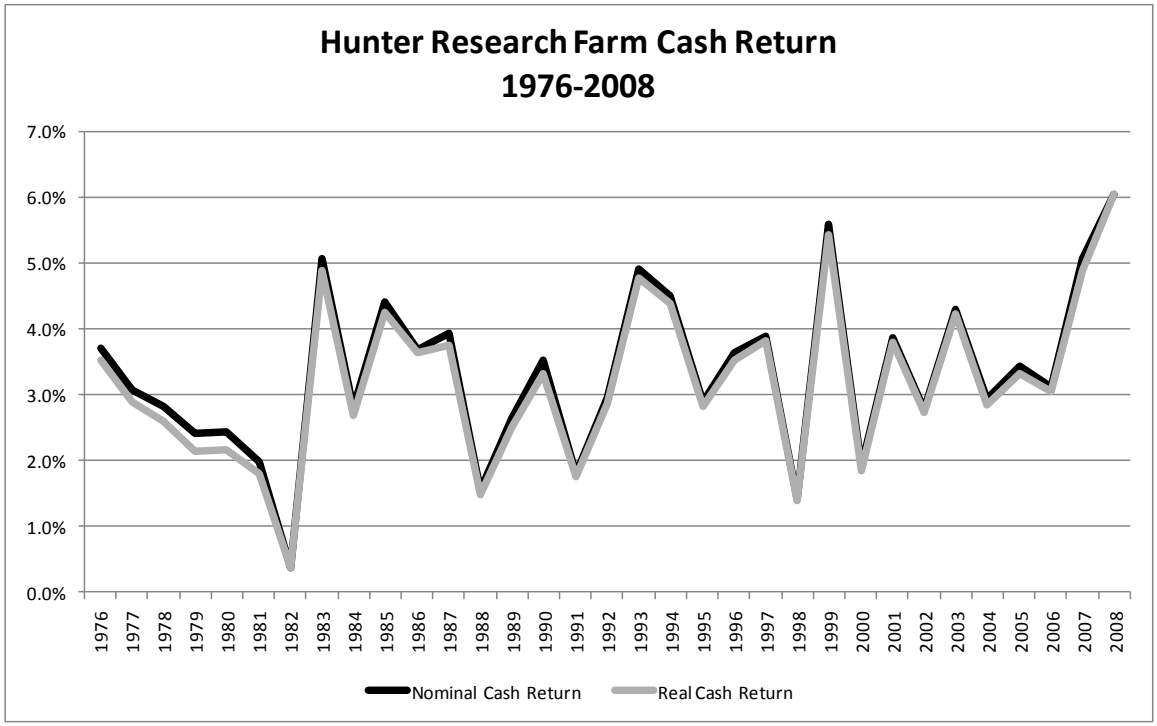


Figure A.21. Hunter Research Farm Nominal and Real Changes in Land Value.

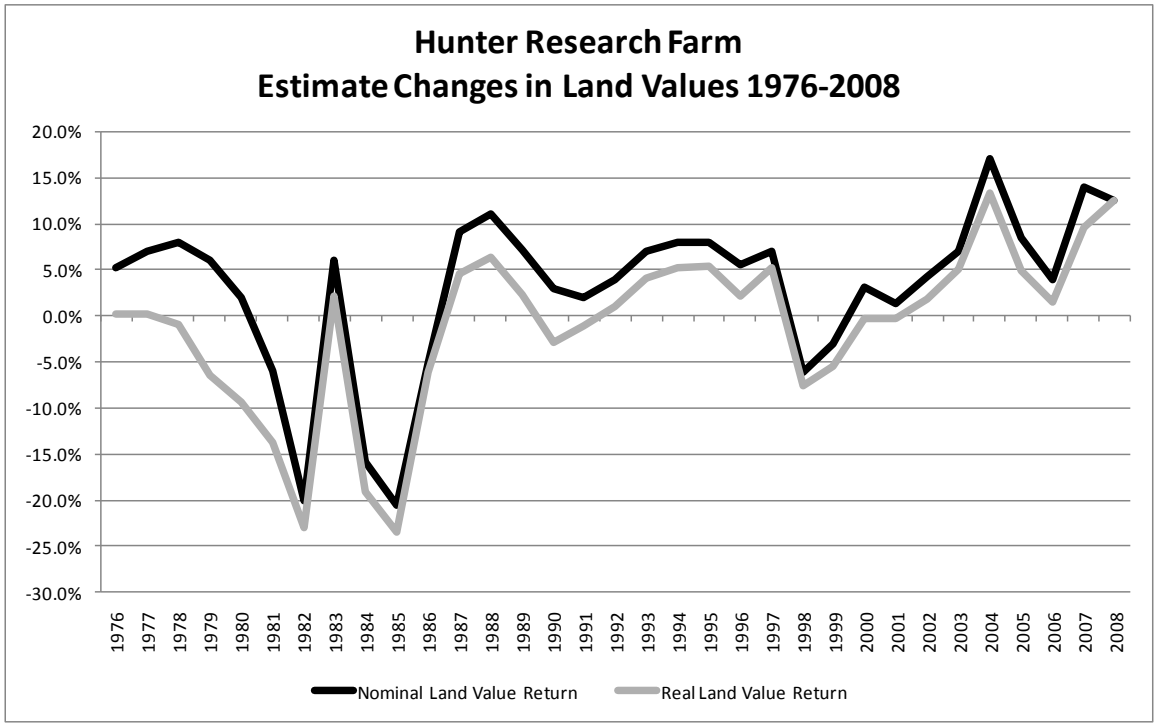


Table A.7. Hunter Research Farm Financial Data (all dollars are in thousands).

Hunter Farm (Research)

Crop Year	Tillable Acres	Total Acres	Beginning of Year Asset Value	End of Year Asset Value	Net Income	Nominal Cash Return	Nominal Land Value Change	Nominal Total Return	Beginning of Year Asset Value (2008 Dollars)	End of Year Asset Value (2008 Dollars)	Net Income (2008 Dollars)	Real Cash Return	Real Land Value Change	Real Total Return
1976	233	280	$ 656	$ 690	$ 24	3.7%	5.2%	8.9%	$ 2,484	$ 2,491	$ 88	3.5%	0.3%	3.8%
1977	233	280	690	738	21	3.1%	7.0%	10.1%	2,491	2,498	72	2.9%	0.3%	3.2%
1978	244	280	738	797	21	2.8%	8.0%	10.8%	2,498	2,475	65	2.6%	-0.9%	1.7%
1979	244	280	797	845	19	2.4%	6.0%	8.4%	2,475	2,315	53	2.1%	-6.4%	-4.3%
1980	247	280	845	862	21	2.4%	2.0%	4.4%	2,315	2,099	50	2.2%	-9.3%	-7.2%
1981	247	280	862	810	17	2.0%	-6.0%	-4.0%	2,099	1,811	38	1.8%	-13.7%	-11.9%
1982	247	280	810	648	3	0.4%	-20.0%	-19.6%	1,811	1,396	7	0.4%	-23.0%	-22.6%
1983	243	280	648	687	33	5.1%	6.1%	11.2%	1,396	1,427	68	4.9%	2.2%	7.1%
1984	243	280	687	578	19	2.8%	-15.9%	-13.1%	1,427	1,154	38	2.7%	-19.1%	-16.4%
1985	243	280	578	459	26	4.4%	-20.6%	-16.2%	1,154	883	49	4.3%	-23.5%	-19.3%
1986	243	280	459	436	17	3.7%	-5.1%	-1.4%	883	829	32	3.6%	-6.1%	-2.5%
1987	243	280	436	476	17	3.9%	9.2%	13.1%	829	867	31	3.8%	4.6%	8.3%
1988	243	280	476	529	7	1.5%	11.1%	12.6%	867	922	13	1.5%	6.4%	7.9%
1989	243	280	529	566	14	2.6%	7.1%	9.7%	922	944	23	2.5%	2.3%	4.9%
1990	243	280	566	583	20	3.5%	3.0%	6.5%	944	916	31	3.3%	-2.9%	0.4%
1991	243	280	583	595	10	1.8%	2.0%	3.8%	916	907	16	1.7%	-1.0%	0.7%
1992	243	280	595	618	18	2.9%	4.0%	6.9%	907	916	26	2.9%	1.1%	3.9%
1993	243	280	618	662	30	4.9%	7.0%	11.9%	916	954	44	4.8%	4.1%	8.9%
1994	243	280	662	715	30	4.5%	8.0%	12.5%	954	1,004	42	4.4%	5.2%	9.6%
1995	243	280	715	772	21	2.9%	8.0%	10.9%	1,004	1,057	28	2.8%	5.3%	8.1%
1996	243	280	772	814	28	3.6%	5.5%	9.2%	1,057	1,079	37	3.5%	2.1%	5.6%
1997	243	280	814	871	32	3.9%	7.0%	10.9%	1,079	1,136	41	3.8%	5.2%	9.0%
1998	243	280	871	819	12	1.4%	-6.1%	-4.7%	1,136	1,050	16	1.4%	-7.6%	-6.2%
1999	243	280	819	794	46	5.6%	-3.0%	2.6%	1,050	992	57	5.4%	-5.5%	-0.1%
2000	243	280	794	819	15	1.9%	3.2%	5.1%	992	990	18	1.8%	-0.2%	1.6%
2001	243	280	819	830	32	3.9%	1.3%	5.1%	990	987	38	3.8%	-0.3%	3.5%
2002	243	280	830	865	23	2.8%	4.3%	7.0%	987	1,005	27	2.7%	1.8%	4.6%
2003	243	280	865	926	37	4.3%	7.0%	11.3%	1,005	1,056	42	4.2%	5.0%	9.3%
2004	243	280	926	1,083	27	2.9%	17.0%	19.9%	1,056	1,196	30	2.8%	13.3%	16.1%
2005	243	280	1,083	1,175	37	3.4%	8.5%	11.9%	1,196	1,255	40	3.3%	4.9%	8.2%
2006	244	280	1,175	1,222	37	3.1%	4.0%	7.1%	1,255	1,273	38	3.0%	1.4%	4.5%
2007	244	280	1,222	1,393	62	5.1%	14.0%	19.1%	1,273	1,395	62	4.9%	9.6%	14.5%
2008	244	280	1,393	1,568	84	6.1%	12.6%	18.6%	1,395	1,568	84	6.0%	12.5%	18.5%

Figure A.22. Hunter Scholarship Farms Nominal and Real Estimated Value per Acre.

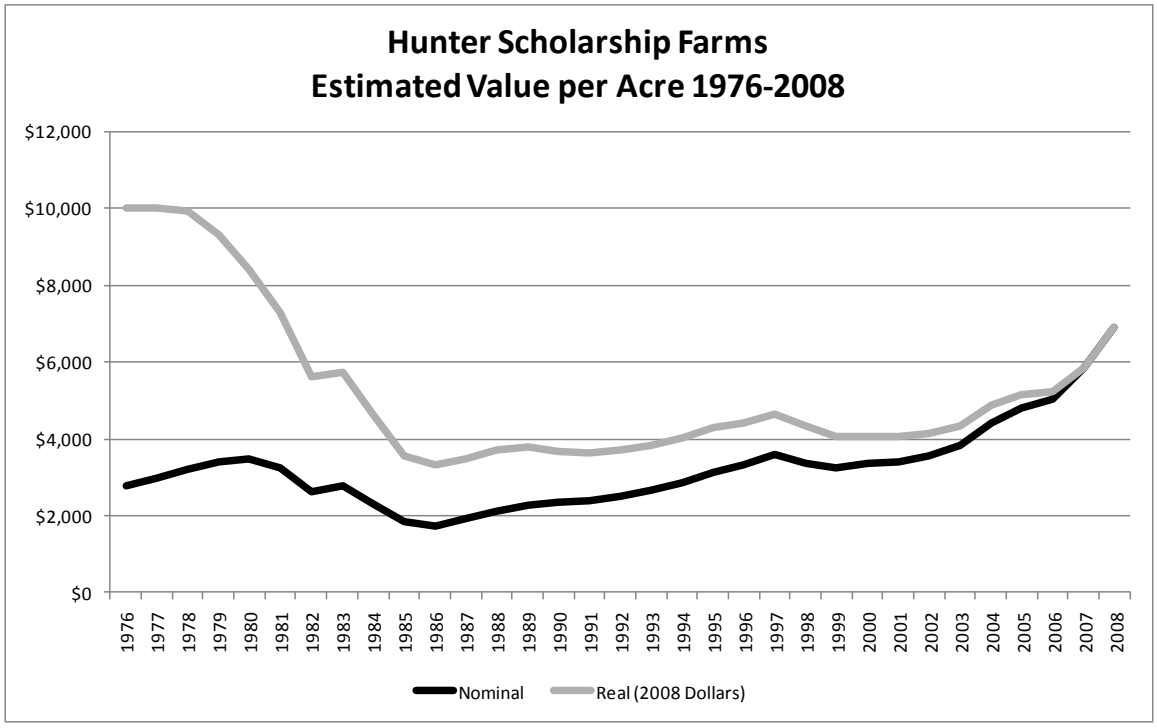


Figure A.23. Hunter Scholarship Farms Nominal and Real Cash Return.

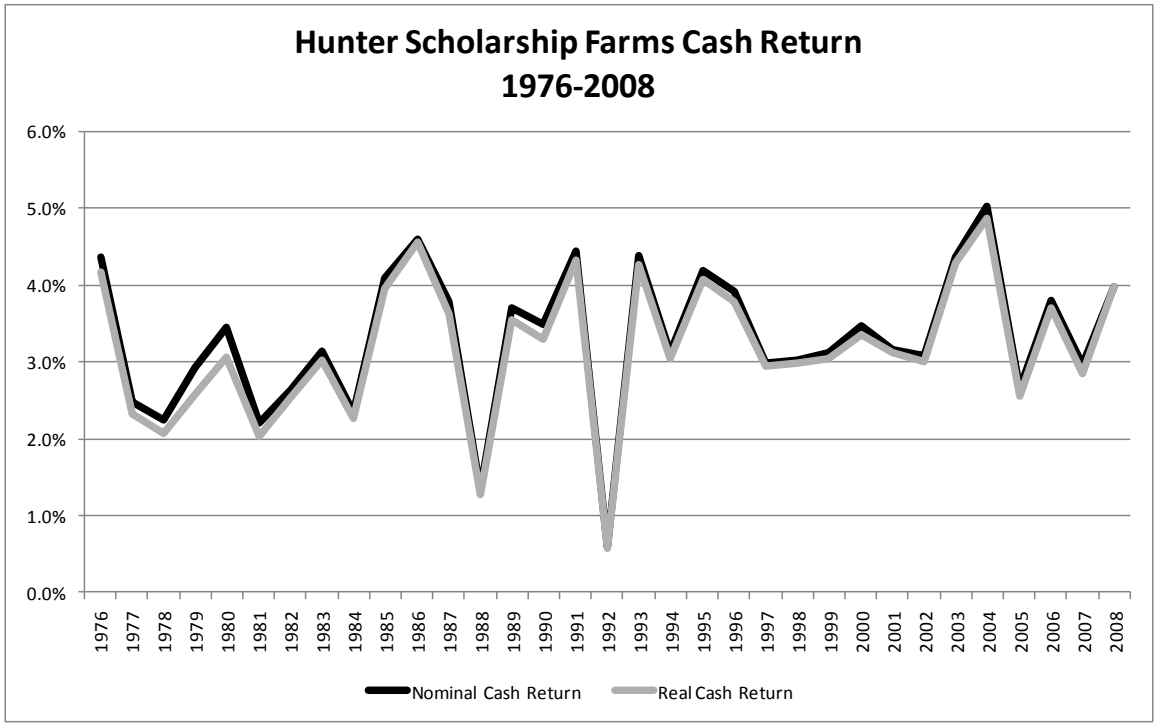


Figure A.24. Hunter Scholarship Farms Nominal and Real Changes in Land Value.

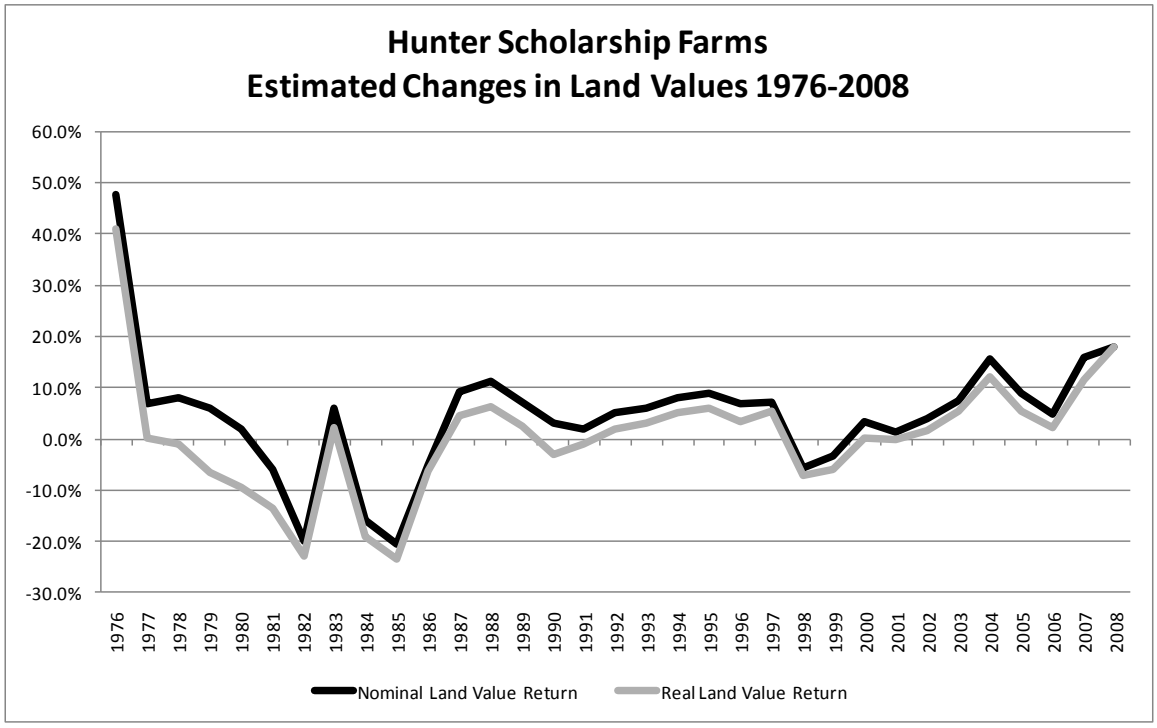


Table A.8. Hunter Scholarship Farms Financial Data (all dollars are in thousands).

Hunter Farm (Scholarship)

Crop Year	Tillable Acres	Total Acres	Beginning of Year Asset Value	End of Year Asset Value	Net Income	Nominal Cash Return	Nominal Land Value Change	Nominal Total Return	Beginning of Year Asset Value (2008 Dollars)	End of Year Asset Value (2008 Dollars)	Net Income (2008 Dollars)	Real Cash Return	Real Land Value Change	Real Total Return
1976	1104	1256	$2,353	$3,478	$103	4.4%	47.8%	52.2%	$ 8,911	$12,563	$371	4.2%	41.0%	45.1%
1977	1104	1256	3,478	3,721	86	2.5%	7.0%	9.5%	12,563	12,598	291	2.3%	0.3%	2.6%
1978	1121	1256	3,721	4,019	84	2.3%	8.0%	10.3%	12,598	12,480	260	2.1%	-0.9%	1.1%
1979	1136	1256	4,019	4,260	117	2.9%	6.0%	8.9%	12,480	11,677	322	2.6%	-6.4%	-3.9%
1980	1151	1256	4,260	4,345	147	3.4%	2.0%	5.4%	11,677	10,585	358	3.1%	-9.3%	-6.3%
1981	1151	1256	4,345	4,085	96	2.2%	-6.0%	-3.8%	10,585	9,135	215	2.0%	-13.7%	-11.7%
1982	1154	1256	4,085	3,268	107	2.6%	-20.0%	-17.4%	9,135	7,039	231	2.5%	-23.0%	-20.4%
1983	1154	1256	3,268	3,467	103	3.1%	6.1%	9.2%	7,039	7,195	213	3.0%	2.2%	5.2%
1984	1169	1256	3,467	2,916	81	2.3%	-15.9%	-13.6%	7,195	5,821	162	2.3%	-19.1%	-16.8%
1985	1172	1256	2,916	2,315	120	4.1%	-20.6%	-16.5%	5,821	4,453	230	3.9%	-23.5%	-19.6%
1986	1171	1265	2,315	2,197	107	4.6%	-5.1%	-0.5%	4,453	4,180	203	4.6%	-6.1%	-1.6%
1987	1171	1256	2,197	2,399	83	3.8%	9.2%	13.0%	4,180	4,371	152	3.6%	4.6%	8.2%
1988	1170	1256	2,399	2,666	32	1.3%	11.1%	12.4%	4,371	4,650	55	1.3%	6.4%	7.7%
1989	1208	1256	2,666	2,855	99	3.7%	7.1%	10.8%	4,650	4,759	165	3.5%	2.3%	5.9%
1990	1211	1256	2,855	2,940	100	3.5%	3.0%	6.5%	4,759	4,620	157	3.3%	-2.9%	0.4%
1991	1200	1256	2,940	2,999	131	4.5%	2.0%	6.5%	4,620	4,572	200	4.3%	-1.0%	3.3%
1992	1198	1256	2,999	3,149	18	0.6%	5.0%	5.6%	4,572	4,666	26	0.6%	2.0%	2.6%
1993	1198	1255	3,149	3,338	138	4.4%	6.0%	10.4%	4,666	4,812	199	4.3%	3.1%	7.4%
1994	1202	1255	3,338	3,605	104	3.1%	8.0%	11.1%	4,812	5,062	146	3.0%	5.2%	8.2%
1995	1202	1255	3,605	3,921	151	4.2%	8.8%	13.0%	5,062	5,370	207	4.1%	6.1%	10.2%
1996	1202	1255	3,921	4,189	153	3.9%	6.8%	10.8%	5,370	5,553	203	3.8%	3.4%	7.2%
1997	1202	1255	4,189	4,485	125	3.0%	7.1%	10.0%	5,553	5,846	163	2.9%	5.3%	8.2%
1998	1202	1255	4,485	4,233	136	3.0%	-5.6%	-2.6%	5,846	5,429	174	3.0%	-7.1%	-4.1%
1999	1202	1256	4,233	4,092	132	3.1%	-3.3%	-0.2%	5,429	5,111	165	3.0%	-5.9%	-2.8%
2000	1202	1256	4,092	4,234	142	3.5%	3.5%	6.9%	5,111	5,116	172	3.4%	0.1%	3.4%
2001	1202	1256	4,234	4,290	134	3.2%	1.3%	4.5%	5,116	5,104	159	3.1%	-0.2%	2.9%
2002	1202	1256	4,290	4,459	132	3.1%	3.9%	7.0%	5,104	5,182	154	3.0%	1.5%	4.5%
2003	1202	1256	4,459	4,785	194	4.4%	7.3%	11.7%	5,182	5,458	222	4.3%	5.3%	9.6%
2004	1202	1256	4,785	5,539	240	5.0%	15.7%	20.8%	5,458	6,119	265	4.9%	12.1%	17.0%
2005	1202	1256	5,539	6,031	147	2.6%	8.9%	11.5%	6,119	6,442	157	2.6%	5.3%	7.9%
2006	1215	1256	6,031	6,324	229	3.8%	4.9%	8.7%	6,442	6,589	238	3.7%	2.3%	6.0%
2007	1215	1256	6,324	7,338	188	3.0%	16.0%	19.0%	6,589	7,345	188	2.9%	11.5%	14.3%
2008	1216	1256	7,338	8,663	292	4.0%	18.1%	22.0%	7,345	8,663	292	4.0%	18.0%	21.9%

Figure A.25. Warren Farm Nominal and Real Estimated Value per Acre.

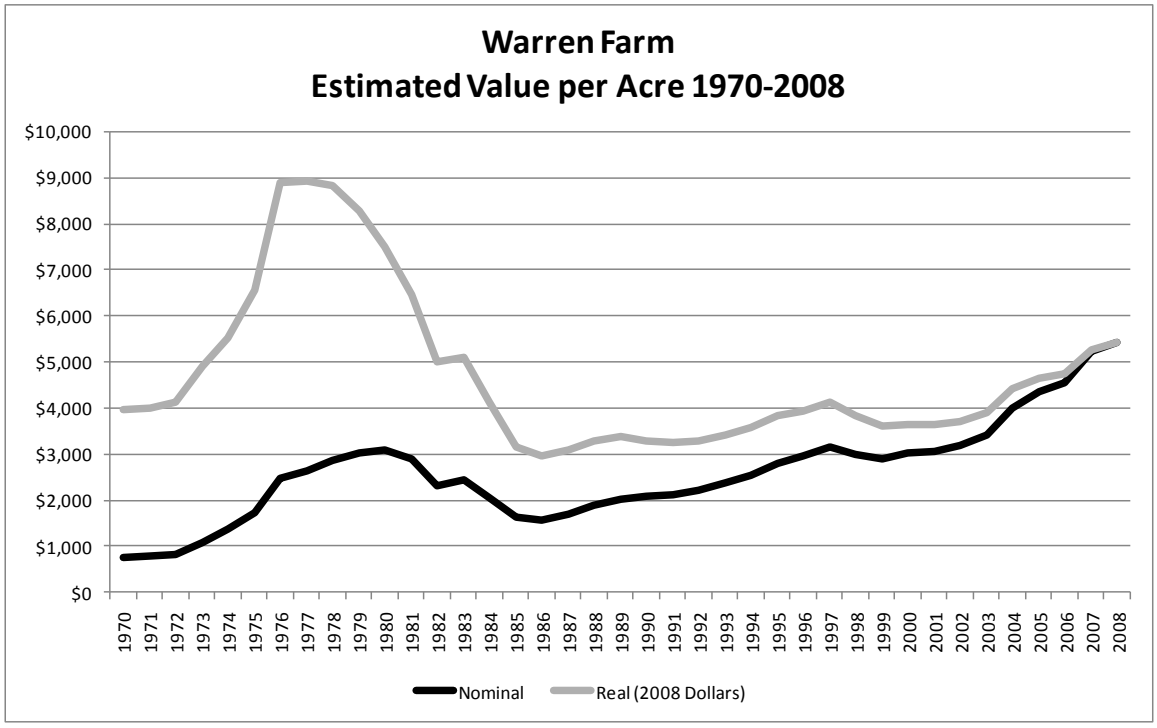


Figure A.26. Warren Farm Nominal and Real Cash Return.

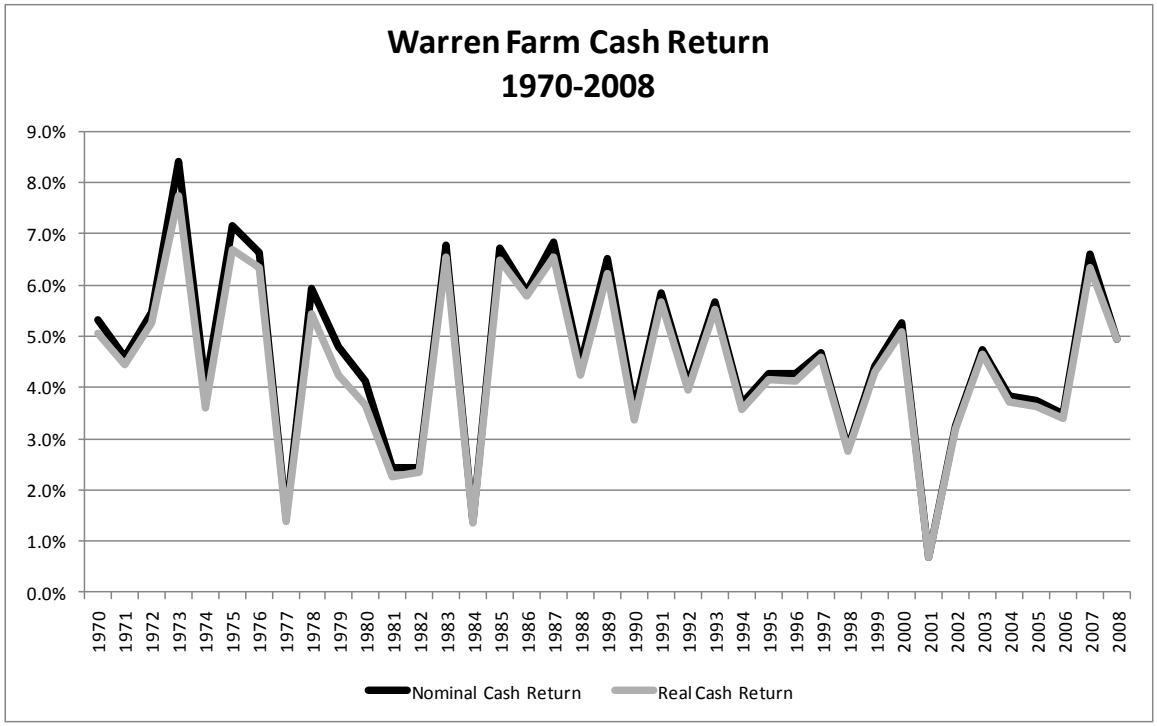


Figure A.27. Warren Farm Nominal and Real Changes in Land Value.

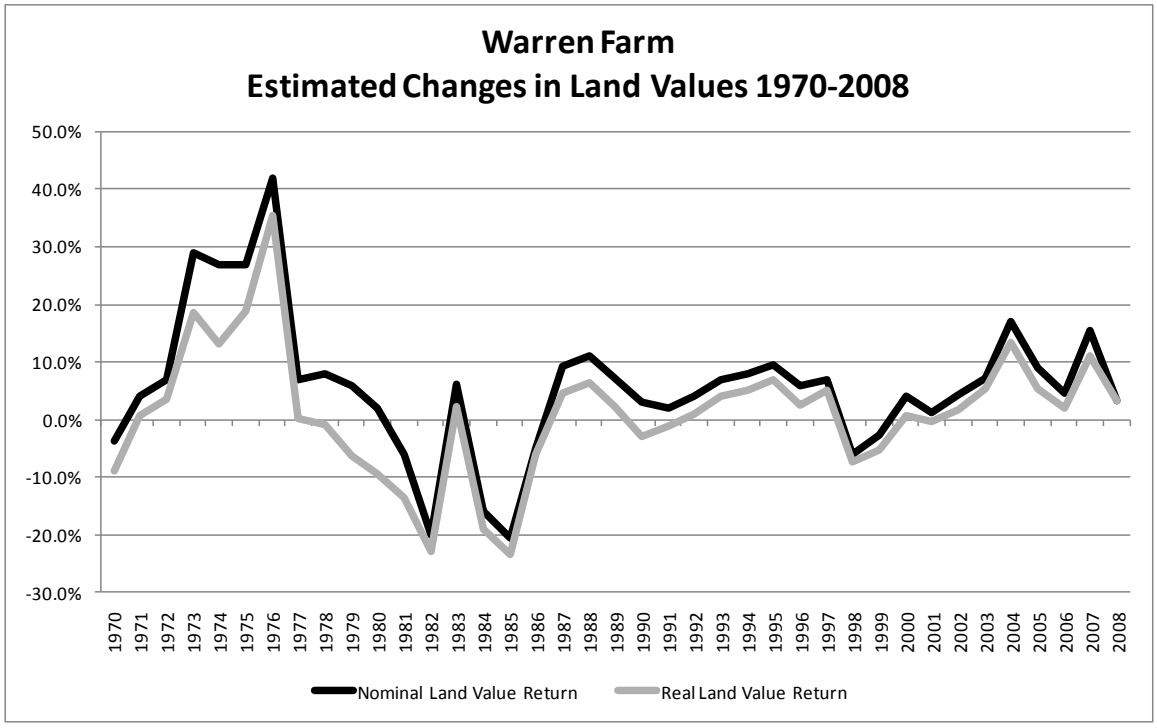


Table A.9. Warren Farm Financial Data (all dollars are in thousands).

Warren Farm

Crop Year	Tillable Acres	Total Acres	Beginning of Year Asset Value	End of Year Asset Value	Net Income	Nominal Cash Return	Nominal Land Value Change	Nominal Total Return	Beginning of Year Asset Value (2008 Dollars)	End of Year Asset Value (2008 Dollars)	Net Income (2008 Dollars)	Real Cash Return	Real Land Value Change	Real Total Return
1970	39	40	$ 31	$ 30	$ 1.7	5.3%	-3.8%	1.5%	$ 174	$ 158	$ 8.8	5.0%	-8.9%	-3.8%
1971	39	40	30	31	1.4	4.6%	4.0%	8.6%	158	160	7.0	4.4%	0.7%	5.1%
1972	29	40	31	33	1.7	5.5%	7.0%	12.5%	160	165	8.4	5.3%	3.5%	8.8%
1973	39	40	33	43	2.8	8.4%	29.0%	37.4%	165	196	12.8	7.7%	18.7%	26.4%
1974	39	40	43	55	1.7	4.0%	27.0%	31.0%	196	221	7.0	3.6%	13.1%	16.6%
1975	39	40	55	69	3.9	7.2%	27.0%	34.2%	221	263	14.8	6.7%	18.8%	25.5%
1976	39	40	69	99	4.6	6.6%	42.0%	48.6%	263	356	16.7	6.3%	35.4%	41.7%
1977	39	40	99	106	1.4	1.5%	7.0%	8.5%	356	357	4.9	1.4%	0.3%	1.7%
1978	39	40	106	114	6.3	5.9%	8.0%	13.9%	357	354	19.4	5.4%	-0.9%	4.5%
1979	39	40	114	121	5.5	4.8%	6.0%	10.8%	354	331	15.0	4.2%	-6.4%	-2.2%
1980	39	40	121	123	5.0	4.1%	2.0%	6.1%	331	300	12.1	3.7%	-9.3%	-5.7%
1981	39	40	123	116	3.0	2.4%	-6.0%	-3.6%	300	259	6.7	2.2%	-13.7%	-11.5%
1982	39	40	116	93	2.8	2.4%	-20.0%	-17.6%	259	200	6.1	2.3%	-23.0%	-20.6%
1983	39	40	93	98	6.3	6.8%	6.1%	12.9%	200	204	13.0	6.5%	2.2%	8.8%
1984	39	40	98	83	1.4	1.4%	-15.9%	-14.5%	204	165	2.7	1.3%	-19.1%	-17.8%
1985	39	40	83	66	5.6	6.7%	-20.6%	-13.9%	165	126	10.7	6.5%	-23.5%	-17.0%
1986	39	40	66	62	3.8	5.9%	-5.1%	0.8%	126	119	7.3	5.8%	-6.1%	-0.3%
1987	39	40	62	68	4.3	6.8%	9.2%	16.0%	119	124	7.8	6.6%	4.6%	11.1%
1988	39	40	68	76	3.0	4.4%	11.1%	15.5%	124	132	5.3	4.3%	6.4%	10.7%
1989	39	40	76	81	4.9	6.5%	7.1%	13.6%	132	135	8.2	6.2%	2.3%	8.6%
1990	39	40	81	83	2.9	3.6%	3.0%	6.6%	135	131	4.6	3.4%	-2.9%	0.4%
1991	39	40	83	85	4.9	5.8%	2.0%	7.8%	131	130	7.4	5.7%	-1.0%	4.6%
1992	39	40	85	88	3.5	4.1%	4.0%	8.1%	130	131	5.1	4.0%	1.1%	5.0%
1993	39	40	88	95	5.0	5.7%	7.0%	12.7%	131	136	7.2	5.5%	4.1%	9.7%
1994	39	40	95	102	3.5	3.7%	8.0%	11.7%	136	144	4.9	3.6%	5.2%	8.8%
1995	39	40	102	112	4.4	4.3%	9.5%	13.8%	144	153	6.0	4.2%	6.8%	11.0%
1996	119	120	336	355	14.4	4.3%	5.8%	10.1%	460	471	19.0	4.1%	2.4%	6.5%
1997	119	120	355	380	16.6	4.7%	7.0%	11.7%	471	495	21.6	4.6%	5.2%	9.8%
1998	119	120	380	357	10.6	2.8%	-6.0%	-3.2%	495	458	13.7	2.8%	-7.5%	-4.7%
1999	119	120	357	347	15.8	4.4%	-2.8%	1.6%	458	434	19.7	4.3%	-5.3%	-1.0%
2000	119	120	347	361	18.3	5.3%	4.0%	9.3%	434	437	22.1	5.1%	0.6%	5.7%
2001	119	120	361	366	2.5	0.7%	1.2%	1.9%	437	435	3.0	0.7%	-0.3%	0.4%
2002	119	120	366	381	11.9	3.3%	4.2%	7.5%	435	443	13.8	3.2%	1.8%	5.0%
2003	119	120	381	409	18.0	4.7%	7.2%	12.0%	443	466	20.6	4.6%	5.2%	9.9%
2004	119	120	409	478	15.7	3.8%	17.0%	20.8%	466	528	17.3	3.7%	13.3%	17.0%
2005	119	120	478	522	17.9	3.7%	9.0%	12.8%	528	557	19.1	3.6%	5.4%	9.1%
2006	119	120	522	545	18.2	3.5%	4.5%	8.0%	557	568	18.9	3.4%	1.9%	5.3%
2007	119	120	545	630	36.1	6.6%	15.5%	22.1%	568	630	36.1	6.4%	10.9%	17.3%
2008	119	120	630	651	31.2	4.9%	3.3%	8.3%	630	651	31.2	4.9%	3.3%	8.2%

Figure A.28. Weber Farms Nominal and Real Estimated Value per Acre.

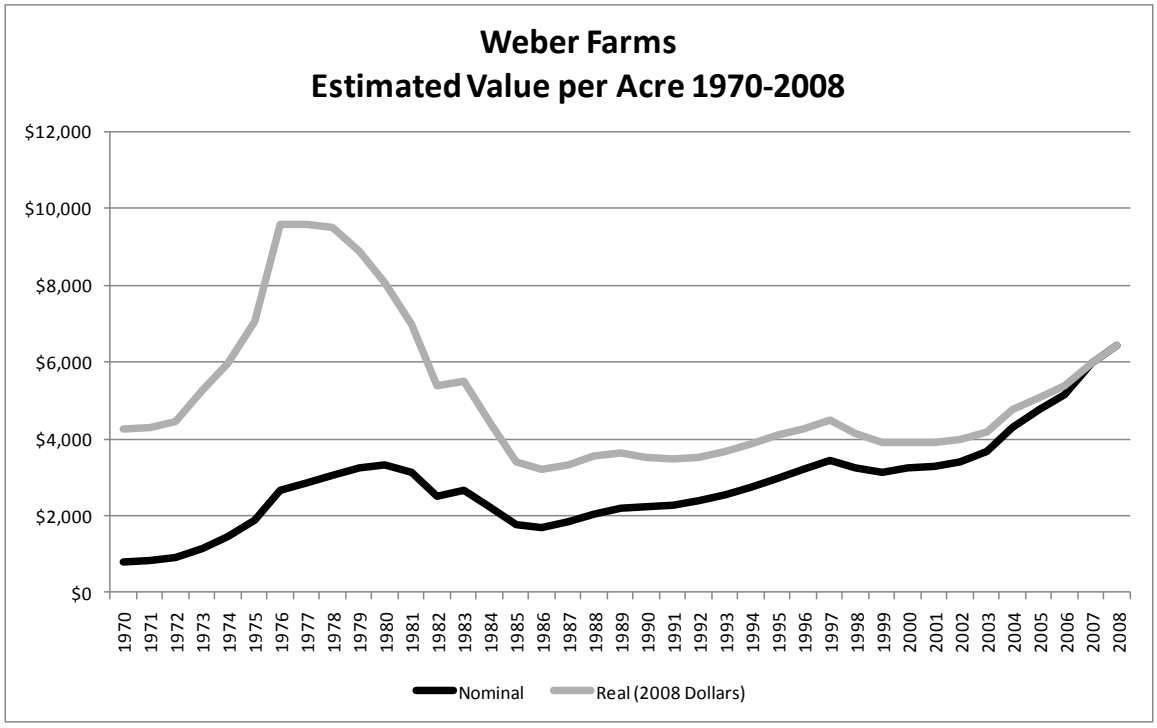


Figure A.29. Weber Farms Nominal and Real Cash Return.

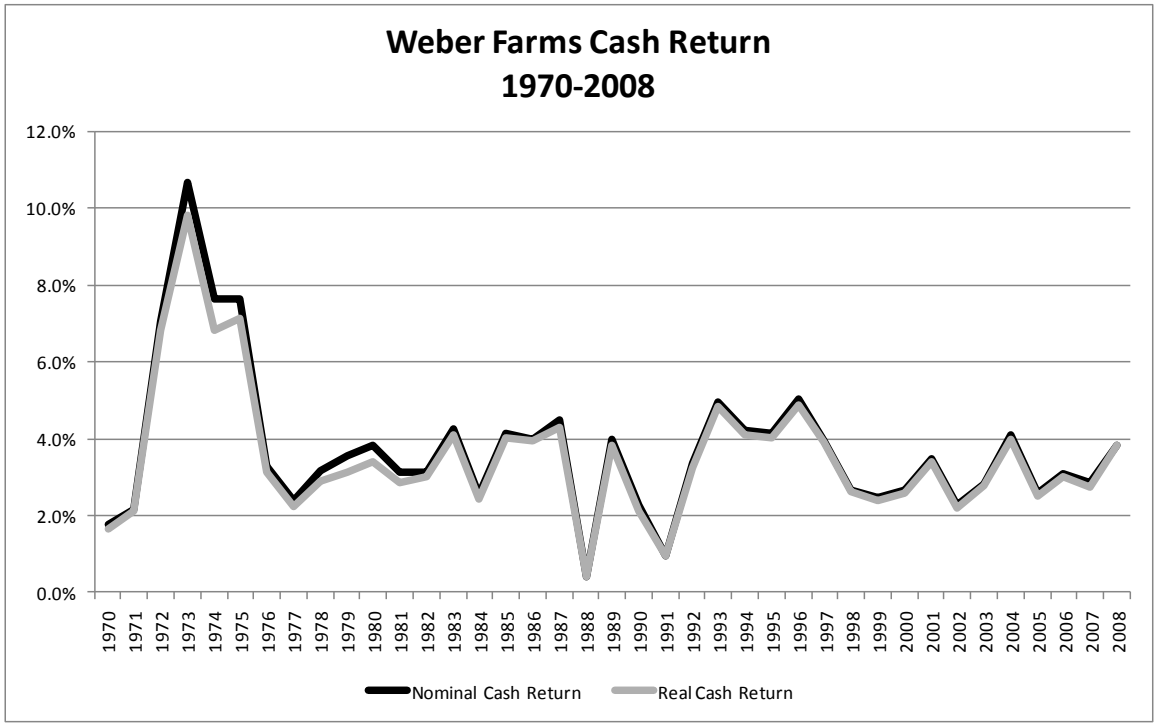


Figure A.30. Weber Farms Nominal and Real Changes in Land Value.

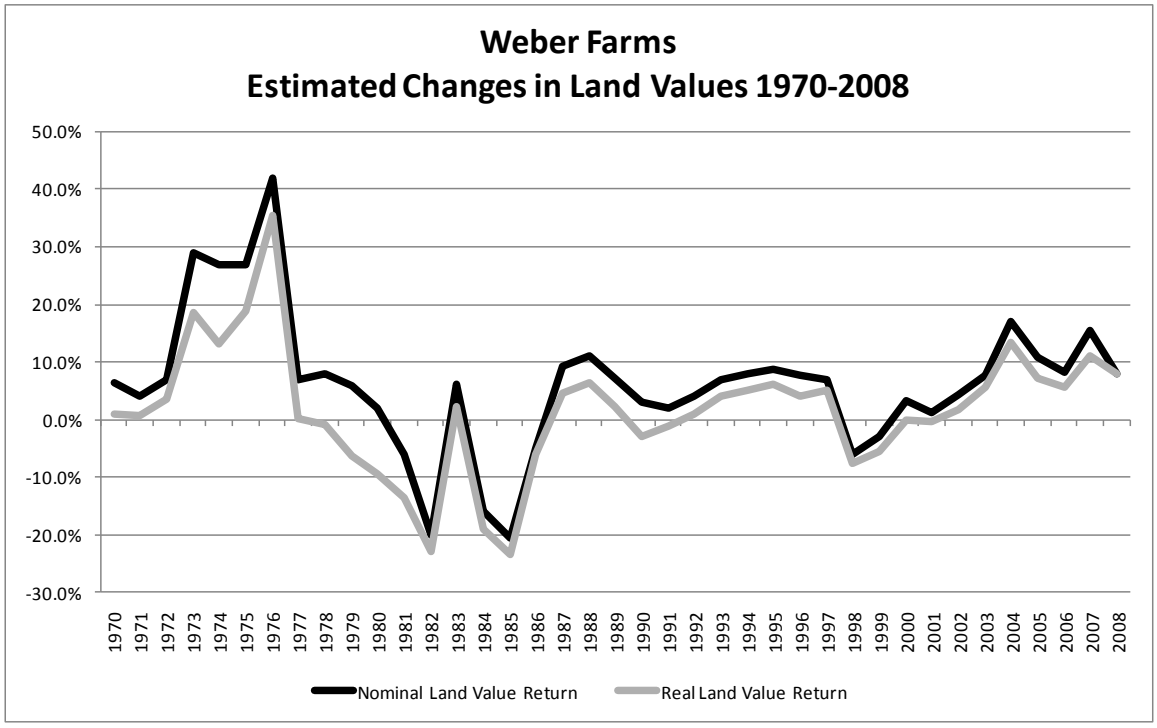


Table A.10. Weber Farm Financial Data (all dollars are in thousands).

Weber Farm

Crop Year	Tillable Acres	Total Acres	Beginning of Year Asset Value	End of Year Asset Value	Net Income	Nominal Cash Return	Nominal Land Value Change	Nominal Total Return	Beginning of Year Asset Value (2008 Dollars)	End of Year Asset Value (2008 Dollars)	Net Income (2008 Dollars)	Real Cash Return	Real Land Value Change	Real Total Return
1970	776	800	$ 606	$ 645	$ 11	1.8%	6.5%	8.3%	$ 3,377	$ 3,407	$ 56	1.7%	0.9%	2.6%
1971	776	800	645	671	14	2.2%	4.0%	6.2%	3,407	3,431	72	2.1%	0.7%	2.8%
1972	776	800	671	718	47	7.0%	7.0%	14.0%	3,431	3,551	234	6.8%	3.5%	10.3%
1973	776	800	718	926	77	10.7%	29.0%	39.7%	3,551	4,214	349	9.8%	18.7%	28.5%
1974	776	800	926	1,176	71	7.7%	27.0%	34.7%	4,214	4,764	287	6.8%	13.1%	19.9%
1975	776	800	1,176	1,494	90	7.6%	27.0%	34.6%	4,764	5,657	340	7.1%	18.8%	25.9%
1976	776	800	1,494	2,121	49	3.3%	42.0%	45.3%	5,657	7,661	176	3.1%	35.4%	38.5%
1977	776	800	2,121	2,269	51	2.4%	7.0%	9.4%	7,661	7,682	171	2.2%	0.3%	2.5%
1978	766	800	2,269	2,451	72	3.2%	8.0%	11.2%	7,682	7,611	222	2.9%	-0.9%	2.0%
1979	766	800	2,451	2,598	87	3.6%	6.0%	9.6%	7,611	7,121	239	3.1%	-6.4%	-3.3%
1980	769	800	2,598	2,650	99	3.8%	2.0%	5.8%	7,121	6,455	241	3.4%	-9.3%	-6.0%
1981	798	800	2,650	2,491	83	3.1%	-6.0%	-2.9%	6,455	5,571	185	2.9%	-13.7%	-10.8%
1982	764	800	2,491	1,993	78	3.1%	-20.0%	-16.9%	5,571	4,292	168	3.0%	-23.0%	-19.9%
1983	764	800	1,993	2,114	85	4.3%	6.1%	10.4%	4,292	4,388	176	4.1%	2.2%	6.3%
1984	767	800	2,114	1,778	54	2.5%	-15.9%	-13.4%	4,388	3,550	107	2.4%	-19.1%	-16.7%
1985	771	800	1,778	1,412	74	4.2%	-20.6%	-16.4%	3,550	2,715	142	4.0%	-23.5%	-19.5%
1986	773	800	1,412	1,340	56	4.0%	-5.1%	-1.1%	2,715	2,549	107	3.9%	-6.1%	-2.2%
1987	773	800	1,340	1,463	60	4.5%	9.2%	13.7%	2,549	2,665	110	4.3%	4.6%	8.9%
1988	774	800	1,463	1,625	6	0.4%	11.1%	11.5%	2,665	2,836	10	0.4%	6.4%	6.8%
1989	774	800	1,625	1,741	65	4.0%	7.1%	11.1%	2,836	2,902	108	3.8%	2.3%	6.2%
1990	758	800	1,741	1,793	39	2.3%	3.0%	5.3%	2,902	2,817	62	2.1%	-2.9%	-0.8%
1991	758	800	1,793	1,829	17	1.0%	2.0%	3.0%	2,817	2,788	26	0.9%	-1.0%	-0.1%
1992	766	800	1,829	1,902	61	3.3%	4.0%	7.3%	2,788	2,818	91	3.3%	1.1%	4.3%
1993	765	800	1,902	2,035	95	5.0%	7.0%	12.0%	2,818	2,935	136	4.8%	4.1%	9.0%
1994	761	800	2,035	2,198	86	4.2%	8.0%	12.2%	2,935	3,087	120	4.1%	5.2%	9.3%
1995	761	800	2,198	2,390	91	4.1%	8.7%	12.9%	3,087	3,273	124	4.0%	6.0%	10.1%
1996	761	800	2,390	2,572	120	5.0%	7.6%	12.6%	3,273	3,409	160	4.9%	4.1%	9.0%
1997	761	800	2,572	2,752	102	4.0%	7.0%	11.0%	3,409	3,586	133	3.9%	5.2%	9.1%
1998	761	800	2,752	2,583	73	2.6%	-6.1%	-3.5%	3,586	3,313	93	2.6%	-7.6%	-5.0%
1999	761	800	2,583	2,505	63	2.4%	-3.0%	-0.6%	3,313	3,129	79	2.4%	-5.5%	-3.2%
2000	761	800	2,505	2,586	67	2.7%	3.2%	5.9%	3,129	3,125	81	2.6%	-0.1%	2.4%
2001	761	800	2,586	2,620	89	3.5%	1.3%	4.8%	3,125	3,117	106	3.4%	-0.2%	3.2%
2002	761	800	2,620	2,731	59	2.3%	4.2%	6.5%	3,117	3,173	69	2.2%	1.8%	4.0%
2003	761	800	2,731	2,938	77	2.8%	7.6%	10.4%	3,173	3,351	88	2.8%	5.6%	8.4%
2004	761	800	2,938	3,437	121	4.1%	17.0%	21.1%	3,351	3,797	134	4.0%	13.3%	17.3%
2005	761	800	3,437	3,809	89	2.6%	10.8%	13.4%	3,797	4,069	95	2.5%	7.2%	9.7%
2006	774	800	3,809	4,123	117	3.1%	8.3%	11.3%	4,069	4,296	122	3.0%	5.6%	8.6%
2007	774	800	4,123	4,763	117	2.8%	15.5%	18.3%	4,296	4,767	118	2.7%	11.0%	13.7%
2008	774	800	4,763	5,143	183	3.8%	8.0%	11.8%	4,767	5,143	183	3.8%	7.9%	11.7%

Figure A.31. Wright Farms Nominal and Real Estimated Value per Acre.

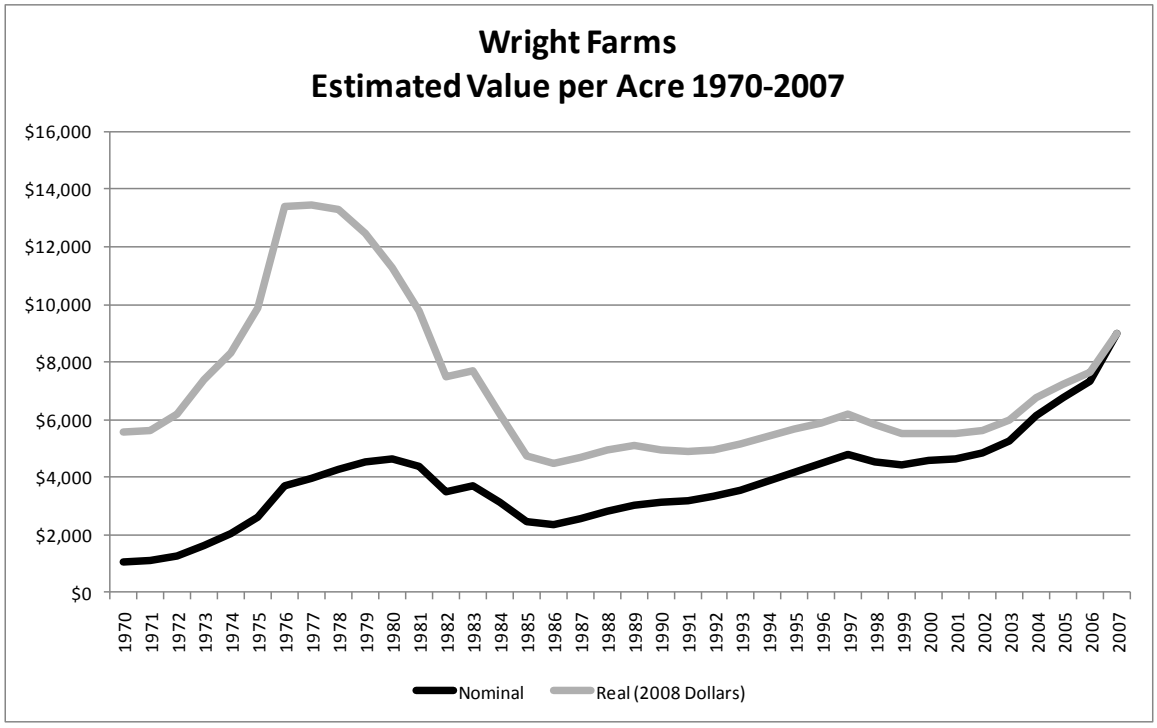


Figure A.32. Wright Farms Nominal and Real Cash Return.

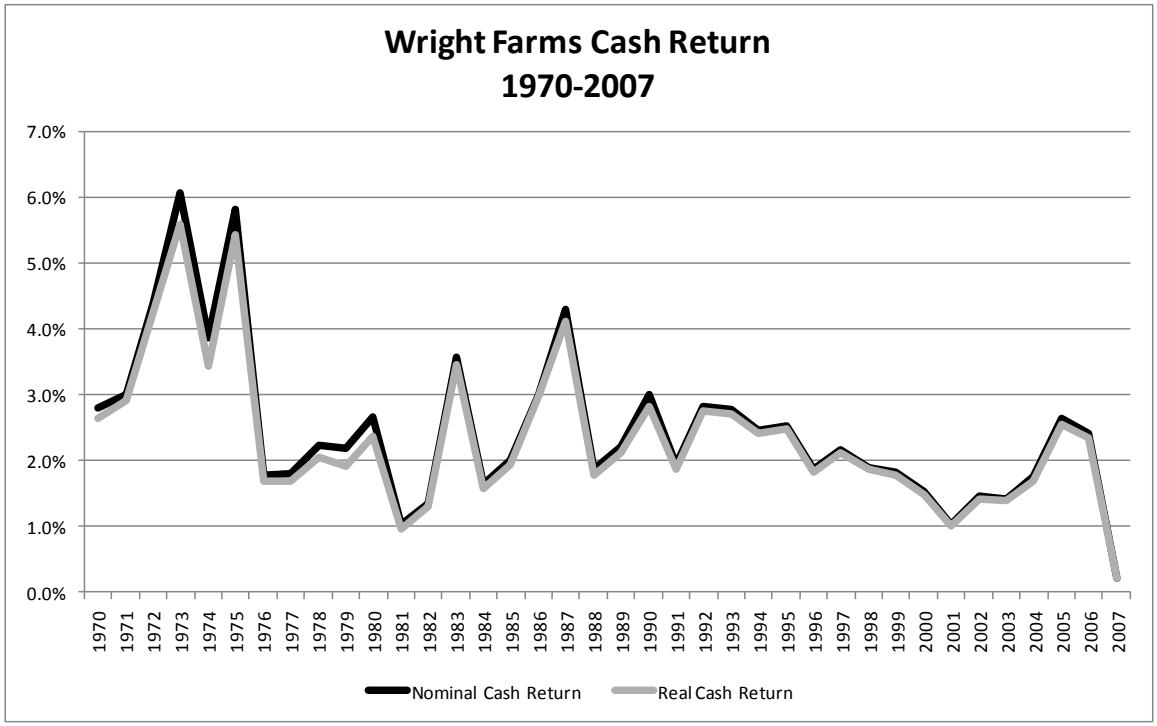


Figure A.33. Wright Farms Nominal and Real Changes in Land Value.

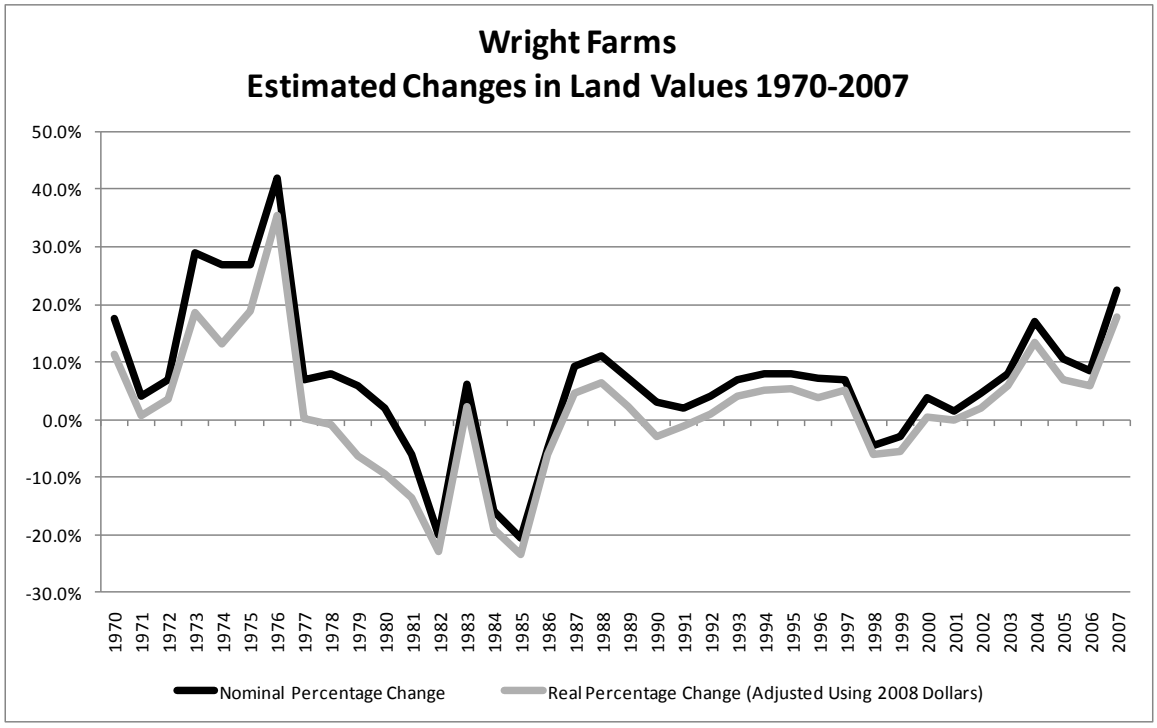


Table A.11. Wright Farm Financial Data (all dollars are in thousands).

Wright Farms

Crop Year	Tillable Acres	Total Acres	Beginning of Year Asset Value	End of Year Asset Value	Net Income	Nominal Cash Return	Nominal Land Value Change	Nominal Total Return	Beginning of Year Asset Value (2008 Dollars)	End of Year Asset Value (2008 Dollars)	Net Income (2008 Dollars)	Real Cash Return	Real Land Value Change	Real Total Return
1970	916	952	$ 859	$1,008	$24	2.8%	17.4%	20.2%	$4,788	$5,326	$127	2.6%	11.2%	13.9%
1971	916	952	1,008	1,049	30	3.0%	4.0%	7.0%	5,326	5,364	155	2.9%	0.7%	3.6%
1972	862	894	1,049	1,122	46	4.4%	7.0%	11.4%	5,364	5,550	227	4.2%	3.5%	7.7%
1973	862	894	1,122	1,447	68	6.1%	29.0%	35.1%	5,550	6,586	310	5.6%	18.7%	24.3%
1974	862	894	1,447	1,838	56	3.9%	27.0%	30.9%	6,586	7,446	226	3.4%	13.1%	16.5%
1975	862	894	1,838	2,334	107	5.8%	27.0%	32.8%	7,446	8,843	405	5.4%	18.8%	24.2%
1976	862	894	2,334	3,315	41	1.8%	42.0%	43.8%	8,843	11,974	150	1.7%	35.4%	37.1%
1977	858	894	3,315	3,547	59	1.8%	7.0%	8.8%	11,974	12,008	201	1.7%	0.3%	2.0%
1978	830	894	3,547	3,831	79	2.2%	8.0%	10.2%	12,008	11,896	247	2.1%	-0.9%	1.1%
1979	858	894	3,831	4,061	84	2.2%	6.0%	8.2%	11,896	11,130	229	1.9%	-6.4%	-4.5%
1980	860	894	4,061	4,142	108	2.7%	2.0%	4.7%	11,130	10,090	263	2.4%	-9.3%	-7.0%
1981	856	894	4,142	3,893	43	1.0%	-6.0%	-5.0%	10,090	8,707	96	1.0%	-13.7%	-12.7%
1982	852	894	3,893	3,115	53	1.4%	-20.0%	-18.6%	8,707	6,709	114	1.3%	-23.0%	-21.6%
1983	852	894	3,115	3,305	112	3.6%	6.1%	9.7%	6,709	6,858	232	3.5%	2.2%	5.7%
1984	851	894	3,305	2,779	54	1.6%	-15.9%	-14.3%	6,858	5,549	108	1.6%	-19.1%	-17.5%
1985	851	894	2,779	2,207	56	2.0%	-20.6%	-18.6%	5,549	4,244	107	1.9%	-23.5%	-21.6%
1986	851	894	2,207	2,094	67	3.0%	-5.1%	-2.1%	4,244	3,984	127	3.0%	-6.1%	-3.1%
1987	851	894	2,094	2,287	90	4.3%	9.2%	13.5%	3,984	4,166	164	4.1%	4.6%	8.7%
1988	851	894	2,287	2,541	43	1.9%	11.1%	13.0%	4,166	4,432	74	1.8%	6.4%	8.2%
1989	851	894	2,541	2,721	56	2.2%	7.1%	9.3%	4,432	4,536	94	2.1%	2.3%	4.5%
1990	851	894	2,721	2,803	81	3.0%	3.0%	6.0%	4,536	4,404	128	2.8%	-2.9%	-0.1%
1991	851	894	2,803	2,859	54	1.9%	2.0%	3.9%	4,404	4,358	83	1.9%	-1.0%	0.8%
1992	851	894	2,859	2,973	81	2.8%	4.0%	6.8%	4,358	4,405	120	2.7%	1.1%	3.8%
1993	851	894	2,973	3,181	83	2.8%	7.0%	9.8%	4,405	4,587	119	2.7%	4.1%	6.8%
1994	851	894	3,181	3,436	79	2.5%	8.0%	10.5%	4,587	4,825	110	2.4%	5.2%	7.6%
1995	851	894	3,436	3,711	87	2.5%	8.0%	10.5%	4,825	5,082	119	2.5%	5.3%	7.8%
1996	851	894	3,711	3,980	70	1.9%	7.3%	9.1%	5,082	5,276	92	1.8%	3.8%	5.6%
1997	851	894	3,980	4,259	86	2.2%	7.0%	9.2%	5,276	5,550	112	2.1%	5.2%	7.3%
1998	851	894	4,259	4,064	81	1.9%	-4.6%	-2.7%	5,550	5,213	104	1.9%	-6.1%	-4.2%
1999	851	893	4,064	3,942	74	1.8%	-3.0%	-1.2%	5,213	4,924	93	1.8%	-5.5%	-3.8%
2000	851	893	3,942	4,089	60	1.5%	3.7%	5.3%	4,924	4,941	73	1.5%	0.3%	1.8%
2001	851	893	4,089	4,145	42	1.0%	1.4%	2.4%	4,941	4,931	50	1.0%	-0.2%	0.8%
2002	851	893	4,145	4,330	60	1.5%	4.5%	5.9%	4,931	5,032	70	1.4%	2.0%	3.5%
2003	851	893	4,330	4,677	61	1.4%	8.0%	9.4%	5,032	5,334	70	1.4%	6.0%	7.4%
2004	851	893	4,677	5,472	82	1.8%	17.0%	18.8%	5,334	6,044	91	1.7%	13.3%	15.0%
2005	851	893	5,472	6,052	145	2.6%	10.6%	13.3%	6,044	6,465	155	2.6%	7.0%	9.5%
2006	870	893	6,052	6,566	146	2.4%	8.5%	10.9%	6,465	6,840	152	2.3%	5.8%	8.1%
2007	870	893	6,566	8,045	14	0.2%	22.5%	22.7%	6,840	8,052	14	0.2%	17.7%	17.9%

Figure A.34. Total Farm Portfolio Nominal and Real Estimated Value per Acre.

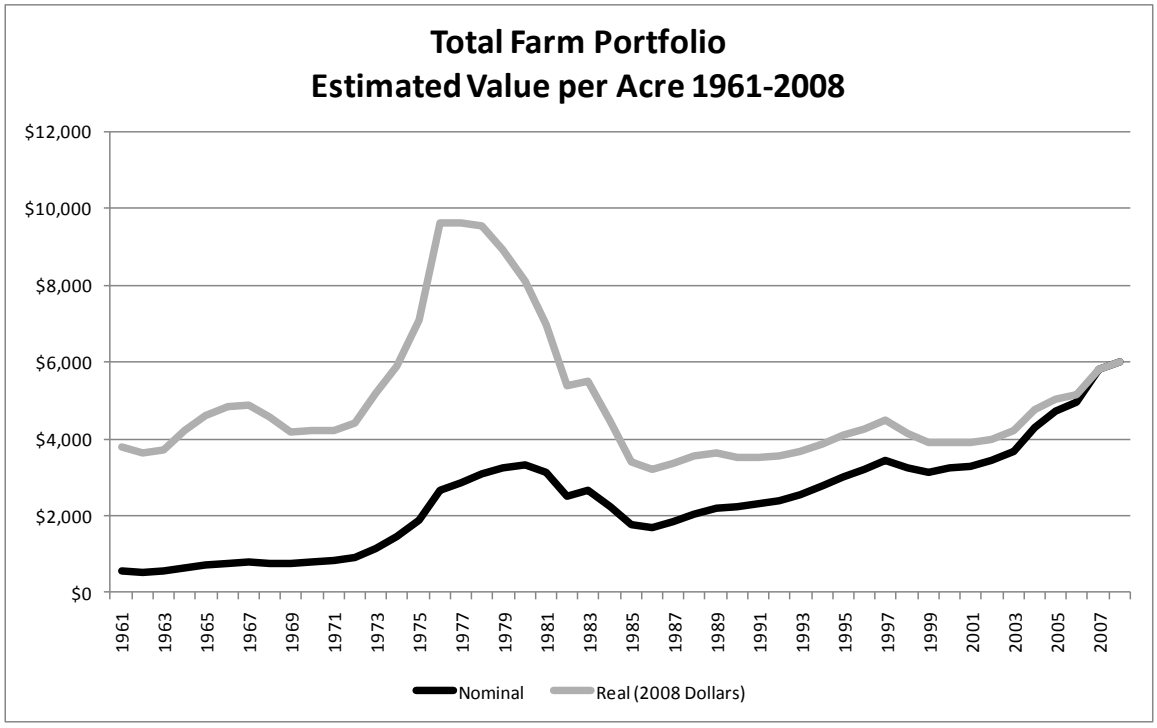


Figure A.35. Total Farm Portfolio Nominal and Real Cash Return.

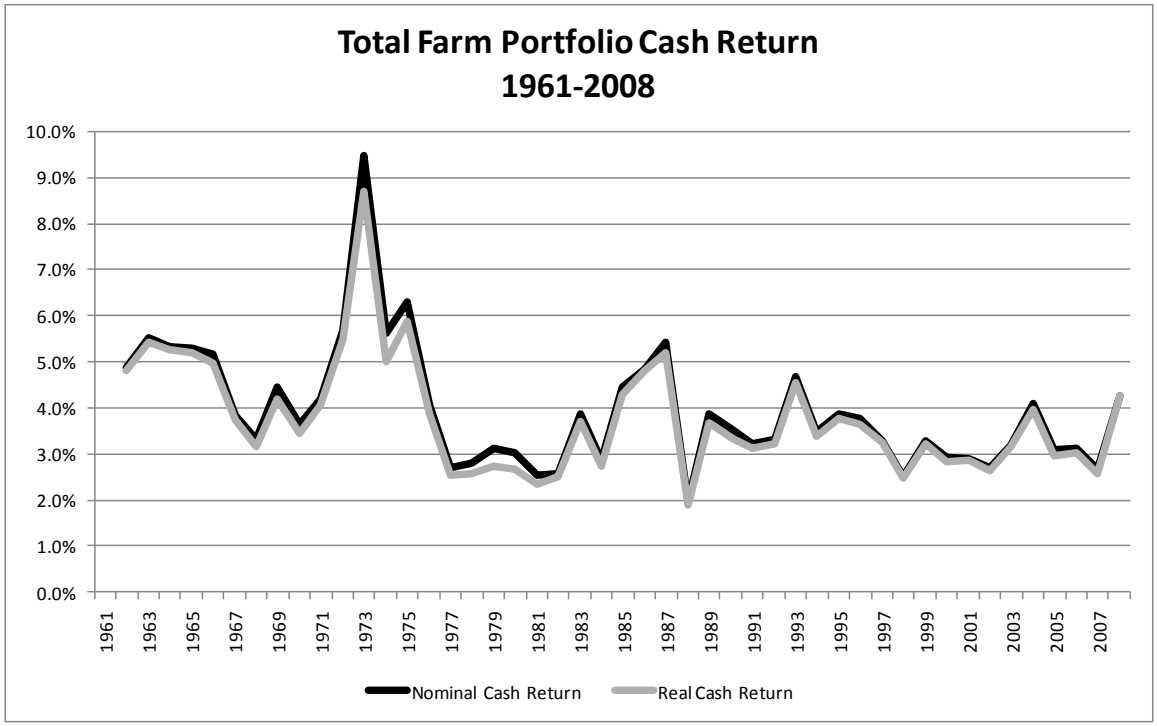


Figure A.36. Total Farm Portfolio Nominal and Real Changes in Land Value.

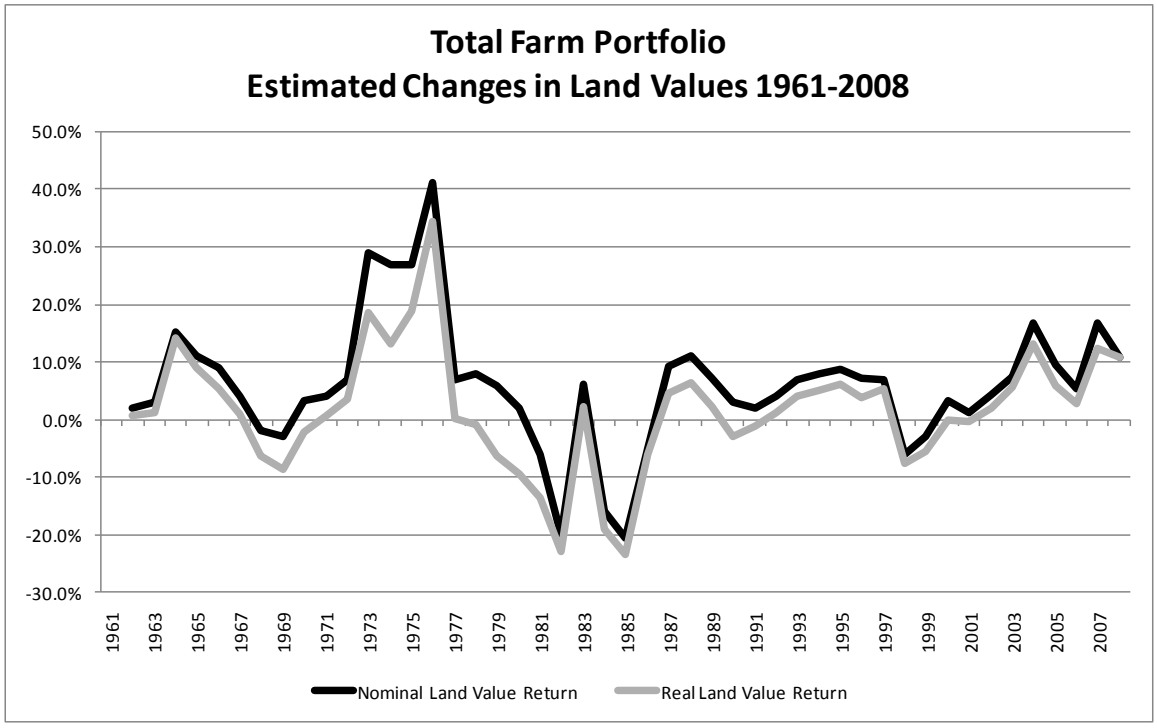


Table A.12. Summary of the Total Portfolio (all dollars are in thousands).

Total Farm Portfolio

Crop Year	Tillable Acres	Total Acres	Beginning of Year Asset Value	End of Year Asset Value	Net Income	Nominal Cash Return	Nominal Land Value Change	Nominal Total Return	Beginning of Year Asset Value (2008 Dollars)	End of Year Asset Value (2008 Dollars)	Net Income (2008 Dollars)	Real Cash Return	Real Land Value Change	Real Total Return
1962	3,564	4,038	$ 2,085	$ 2,126	$ 101	4.9%	2.0%	6.9%	$ 14,609	$ 14,705	$ 701	4.8%	0.7%	5.5%
1963	3,564	4,038	2,126	2,190	117	5.5%	3.0%	8.5%	14,705	14,901	798	5.4%	1.3%	6.8%
1964	3,564	4,038	2,190	2,523	116	5.3%	15.2%	20.5%	14,901	16,999	784	5.3%	14.1%	19.3%
1965	3,564	4,038	2,523	2,800	134	5.3%	11.0%	16.3%	16,999	18,513	885	5.2%	8.9%	14.1%
1966	3,564	4,038	2,800	3,052	144	5.2%	9.0%	14.2%	18,513	19,504	922	5.0%	5.4%	10.3%
1967	3,564	4,038	3,052	3,174	117	3.8%	4.0%	7.8%	19,504	19,686	726	3.7%	0.9%	4.7%
1968	3,564	4,038	3,174	3,111	105	3.3%	-2.0%	1.3%	19,686	18,423	622	3.2%	-6.4%	-3.3%
1969	3,564	4,038	3,111	3,018	138	4.4%	-3.0%	1.4%	18,423	16,827	770	4.2%	-8.7%	-4.5%
1970	5,637	6,246	4,812	4,971	175	3.6%	3.3%	6.9%	26,834	26,257	922	3.4%	-2.2%	1.3%
1971	5,645	6,246	4,971	5,170	208	4.2%	4.0%	8.2%	26,257	26,444	1,063	4.0%	0.7%	4.8%
1972	5,581	6,188	5,170	5,532	294	5.7%	7.0%	12.7%	26,444	27,363	1,453	5.5%	3.5%	9.0%
1973	5,781	6,388	5,661	7,297	536	9.5%	28.9%	38.4%	28,004	33,205	2,439	8.7%	18.6%	27.3%
1974	5,692	6,357	7,297	9,267	410	5.6%	27.0%	32.6%	33,205	37,539	1,661	5.0%	13.1%	18.1%
1975	5,819	6,299	9,267	11,770	584	6.3%	27.0%	33.3%	37,539	44,582	2,212	5.9%	18.8%	24.7%
1976	7,245	7,955	15,012	21,179	609	4.1%	41.1%	45.1%	56,864	76,501	2,201	3.9%	34.5%	38.4%
1977	7,324	8,035	21,399	22,863	580	2.7%	6.8%	9.6%	77,295	77,399	1,962	2.5%	0.1%	2.7%
1978	7,208	8,035	22,863	24,692	640	2.8%	8.0%	10.8%	77,399	76,676	1,988	2.6%	-0.9%	1.6%
1979	7,381	8,035	24,692	26,174	769	3.1%	6.0%	9.1%	76,676	71,740	2,108	2.7%	-6.4%	-3.7%
1980	7,405	8,035	26,174	26,697	791	3.0%	2.0%	5.0%	71,740	65,035	1,926	2.7%	-9.3%	-6.7%
1981	7,430	8,035	26,697	25,095	678	2.5%	-6.0%	-3.5%	65,035	56,125	1,517	2.3%	-13.7%	-11.4%
1982	7,400	8,035	25,095	20,076	649	2.6%	-20.0%	-17.4%	56,125	43,244	1,398	2.5%	-23.0%	-20.5%
1983	7,401	8,035	20,076	21,301	775	3.9%	6.1%	10.0%	43,244	44,206	1,609	3.7%	2.2%	5.9%
1984	7,418	8,035	21,301	17,914	607	2.9%	-15.9%	-13.0%	44,206	35,765	1,212	2.7%	-19.1%	-16.4%
1985	7,423	8,035	17,914	14,224	797	4.5%	-20.6%	-16.1%	35,765	27,358	1,534	4.3%	-23.5%	-19.2%
1986	7,428	8,044	14,224	13,498	690	4.9%	-5.1%	-0.2%	27,358	25,681	1,313	4.8%	-6.1%	-1.3%
1987	7,428	8,035	13,498	14,740	732	5.4%	9.2%	14.6%	25,681	26,853	1,333	5.2%	4.6%	9.8%
1988	7,490	8,035	14,740	16,376	290	2.0%	11.1%	13.1%	26,853	28,571	506	1.9%	6.4%	8.3%
1989	7,513	8,034	16,376	17,539	632	3.9%	7.1%	11.0%	28,571	29,240	1,053	3.7%	2.3%	6.0%
1990	7,504	8,035	17,539	18,065	622	3.5%	3.0%	6.5%	29,240	28,384	978	3.3%	-2.9%	0.4%
1991	7,501	8,034	18,065	18,427	581	3.2%	2.0%	5.2%	28,384	28,091	885	3.1%	-1.0%	2.1%
1992	7,507	8,034	18,427	19,194	609	3.3%	4.2%	7.5%	28,091	28,436	902	3.2%	1.2%	4.4%
1993	7,506	8,034	19,194	20,504	898	4.7%	6.8%	11.5%	28,436	29,565	1,295	4.6%	4.0%	8.5%
1994	7,505	8,034	20,504	22,146	711	3.5%	8.0%	11.5%	29,565	31,100	998	3.4%	5.2%	8.6%
1995	7,505	8,034	22,146	24,085	854	3.9%	8.8%	12.6%	31,100	32,986	1,170	3.8%	6.1%	9.8%
1996	7,585	8,114	24,309	26,053	918	3.8%	7.2%	11.0%	33,292	34,534	1,217	3.7%	3.7%	7.4%
1997	7,585	8,114	26,053	27,883	858	3.3%	7.0%	10.3%	34,534	36,341	1,118	3.2%	5.2%	8.5%
1998	7,571	8,114	27,883	26,213	697	2.5%	-6.0%	-3.5%	36,341	33,622	894	2.5%	-7.5%	-5.0%
1999	7,576	8,120	26,213	25,417	864	3.3%	-3.0%	0.3%	33,622	31,749	1,080	3.2%	-5.6%	-2.4%
2000	7,576	8,120	25,417	26,280	745	2.9%	3.4%	6.3%	31,749	31,752	900	2.8%	0.0%	2.8%
2001	7,575	8,120	26,280	26,625	765	2.9%	1.3%	4.2%	31,752	31,677	910	2.9%	-0.2%	2.6%
2002	7,576	8,120	26,625	27,793	716	2.7%	4.4%	7.1%	31,677	32,299	832	2.6%	2.0%	4.6%
2003	7,576	8,120	27,793	29,884	890	3.2%	7.5%	10.7%	32,299	34,089	1,015	3.1%	5.5%	8.7%
2004	7,575	8,120	29,884	34,905	1,225	4.1%	16.8%	20.9%	34,089	38,560	1,353	4.0%	13.1%	17.1%
2005	7,576	8,120	34,905	38,220	1,074	3.1%	9.5%	12.6%	38,560	40,828	1,148	3.0%	5.9%	8.9%
2006	7,654	8,120	38,220	40,261	1,188	3.1%	5.3%	8.4%	40,828	41,942	1,237	3.0%	2.7%	5.8%
2007	7,654	8,120	40,261	47,041	1,080	2.7%	16.8%	19.5%	41,942	47,084	1,081	2.6%	12.3%	14.8%
2008	6,774	7,216	38,996	43,240	1,664	4.3%	10.9%	15.2%	39,032	43,240	1,664	4.3%	10.8%	15.0%

Table A.13. Eastern Farm Portfolio Financial Data (all dollar amounts are in thousands).

Eastern Illinois Farm Portfolio (Allerton, Campbell, Carter-Pennell, DeHart, Hubbell, Hunter-Research and Warren)

Crop Year	Tillable Acres	Total Acres	Beginning of Year Asset Value	End of Year Asset Value	Net Income	Nominal Cash Return	Nominal Land Value Change	Nominal Total Return	Beginning of Year Asset Value (2008 Dollars)	End of Year Asset Value (2008 Dollars)	Net Income (2008 Dollars)	Real Cash Return	Real Land Value Change	Real Total Return
1962	3,564	4,038	2,085	2,126	101	4.9%	2.0%	6.9%	14,609	14,705	701	4.8%	0.7%	5.5%
1963	3,564	4,038	2,126	2,190	117	5.5%	3.0%	8.5%	14,705	14,901	798	5.4%	1.3%	6.8%
1964	3,564	4,038	2,190	2,523	116	5.3%	15.2%	20.5%	14,901	16,999	784	5.3%	14.1%	19.3%
1965	3,564	4,038	2,523	2,800	134	5.3%	11.0%	16.3%	16,999	18,513	885	5.2%	8.9%	14.1%
1966	3,564	4,038	2,800	3,052	144	5.2%	9.0%	14.2%	18,513	19,504	922	5.0%	5.4%	10.3%
1967	3,564	4,038	3,052	3,174	117	3.8%	4.0%	7.8%	19,504	19,686	726	3.7%	0.9%	4.7%
1968	3,564	4,038	3,174	3,111	105	3.3%	-2.0%	1.3%	19,686	18,423	622	3.2%	-6.4%	-3.3%
1969	3,564	4,038	3,111	3,018	138	4.4%	-3.0%	1.4%	18,423	16,827	770	4.2%	-8.7%	-4.5%
1970	3,945	4,494	3,348	3,318	140	4.2%	-0.9%	3.3%	18,670	17,524	739	4.0%	-6.1%	-2.2%
1971	3,953	4,494	3,318	3,450	164	4.9%	4.0%	8.9%	17,524	17,649	837	4.8%	0.7%	5.5%
1972	3,943	4,494	3,450	3,692	200	5.8%	7.0%	12.8%	17,649	18,262	992	5.6%	3.5%	9.1%
1973	4,143	4,694	3,821	4,924	391	10.2%	28.8%	39.1%	18,903	22,406	1,780	9.4%	18.5%	27.9%
1974	4,054	4,663	4,924	6,253	283	5.8%	27.0%	32.8%	22,406	25,330	1,148	5.1%	13.1%	18.2%
1975	4,181	4,605	6,253	7,942	387	6.2%	27.0%	33.2%	25,330	30,082	1,468	5.8%	18.8%	24.6%
1976	4,503	5,005	8,831	12,265	416	4.7%	38.9%	43.6%	33,453	44,303	1,503	4.5%	32.4%	36.9%
1977	4,586	5,085	12,485	13,326	383	3.1%	6.7%	9.8%	45,098	45,111	1,298	2.9%	0.0%	2.9%
1978	4,492	5,085	13,326	14,392	405	3.0%	8.0%	11.0%	45,111	44,690	1,258	2.8%	-0.9%	1.9%
1979	4,621	5,085	14,392	15,255	481	3.3%	6.0%	9.3%	44,690	41,813	1,318	2.9%	-6.4%	-3.5%
1980	4,625	5,085	15,255	15,560	437	2.9%	2.0%	4.9%	41,813	37,905	1,064	2.5%	-9.3%	-6.8%
1981	4,625	5,085	15,560	14,627	456	2.9%	-6.0%	-3.1%	37,905	32,712	1,021	2.7%	-13.7%	-11.0%
1982	4,630	5,085	14,627	11,701	411	2.8%	-20.0%	-17.2%	32,712	25,204	886	2.7%	-23.0%	-20.2%
1983	4,631	5,085	11,701	12,415	476	4.1%	6.1%	10.2%	25,204	25,765	988	3.9%	2.2%	6.1%
1984	4,631	5,085	12,415	10,441	418	3.4%	-15.9%	-12.5%	25,765	20,845	835	3.2%	-19.1%	-15.9%
1985	4,629	5,085	10,441	8,290	548	5.3%	-20.6%	-15.3%	20,845	15,945	1,055	5.1%	-23.5%	-18.4%
1986	4,634	5,085	8,290	7,867	461	5.6%	-5.1%	0.5%	15,945	14,968	877	5.5%	-6.1%	-0.6%
1987	4,634	5,085	7,867	8,591	498	6.3%	9.2%	15.5%	14,968	15,651	908	6.1%	4.6%	10.6%
1988	4,695	5,085	8,591	9,545	210	2.4%	11.1%	13.5%	15,651	16,652	366	2.3%	6.4%	8.7%
1989	4,680	5,084	9,545	10,222	412	4.3%	7.1%	11.4%	16,652	17,042	687	4.1%	2.3%	6.5%
1990	4,683	5,085	10,222	10,529	402	3.9%	3.0%	6.9%	17,042	16,544	631	3.7%	-2.9%	0.8%
1991	4,691	5,085	10,529	10,740	378	3.6%	2.0%	5.6%	16,544	16,373	577	3.5%	-1.0%	2.5%
1992	4,691	5,085	10,740	11,169	449	4.2%	4.0%	8.2%	16,373	16,548	665	4.1%	1.1%	5.1%
1993	4,691	5,085	11,169	11,950	583	5.2%	7.0%	12.2%	16,548	17,231	840	5.1%	4.1%	9.2%
1994	4,691	5,085	11,950	12,907	443	3.7%	8.0%	11.7%	17,231	18,126	622	3.6%	5.2%	8.8%
1995	4,691	5,085	12,907	14,063	525	4.1%	9.0%	13.0%	18,126	19,260	720	4.0%	6.3%	10.2%
1996	4,771	5,165	14,287	15,312	575	4.0%	7.2%	11.2%	19,260	20,297	762	4.0%	5.4%	9.3%
1997	4,771	5,165	15,312	16,387	545	3.6%	7.0%	10.6%	20,297	21,358	710	3.5%	5.2%	8.7%
1998	4,757	5,165	16,387	15,334	408	2.5%	-6.4%	-3.9%	21,358	19,668	523	2.4%	-7.9%	-5.5%
1999	4,762	5,171	15,334	14,877	595	3.9%	-3.0%	0.9%	19,668	18,584	743	3.8%	-5.5%	-1.7%
2000	4,762	5,171	14,877	15,370	476	3.2%	3.3%	6.5%	18,584	18,571	575	3.1%	-0.1%	3.0%
2001	4,761	5,171	15,370	15,570	500	3.3%	1.3%	4.6%	18,571	18,524	595	3.2%	-0.2%	3.0%
2002	4,762	5,171	15,570	16,274	464	3.0%	4.5%	7.5%	18,524	18,912	539	2.9%	2.1%	5.0%
2003	4,762	5,171	16,274	17,485	557	3.4%	7.4%	10.9%	18,912	19,945	635	3.4%	5.5%	8.8%
2004	4,761	5,171	17,485	20,457	781	4.5%	17.0%	21.5%	19,945	22,599	863	4.3%	13.3%	17.6%
2005	4,762	5,171	20,457	22,328	694	3.4%	9.1%	12.5%	22,599	23,852	741	3.3%	5.5%	8.8%
2006	4,795	5,171	22,328	23,247	696	3.1%	4.1%	7.2%	23,852	24,218	725	3.0%	1.5%	4.6%
2007	4,795	5,171	23,247	26,895	760	3.3%	15.7%	19.0%	24,218	26,920	761	3.1%	11.2%	14.3%
2008	4,785	5,160	26,895	29,434	1,189	4.4%	9.4%	13.9%	26,920	29,434	1,189	4.4%	9.3%	13.8%

Table A.14. Western Farm Portfolio Financial Data (all dollars are in thousands).

Western Illinois Farm Portfolio (Hunter-Scholarship)

Crop Year	Tillable Acres	Total Acres	Beginning of Year Asset Value	End of Year Asset Value	Net Income	Nominal Cash Return	Nominal Land Value Change	Nominal Total Return	Beginning of Year Asset Value (2008 Dollars)	End of Year Asset Value (2008 Dollars)	Net Income (2008 Dollars)	Real Cash Return	Real Land Value Change	Real Total Return
1976	1,104	1,256	$2,353	$3,478	$103	4.4%	47.8%	52.2%	$ 8,911	$12,563	$371	4.2%	41.0%	45.1%
1977	1,104	1,256	3,478	3,721	86	2.5%	7.0%	9.5%	12,563	12,598	291	2.3%	0.3%	2.6%
1978	1,121	1,256	3,721	4,019	84	2.3%	8.0%	10.3%	12,598	12,480	260	2.1%	-0.9%	1.1%
1979	1,136	1,256	4,019	4,260	117	2.9%	6.0%	8.9%	12,480	11,677	322	2.6%	-6.4%	-3.9%
1980	1,151	1,256	4,260	4,345	147	3.4%	2.0%	5.4%	11,677	10,585	358	3.1%	-9.3%	-6.3%
1981	1,151	1,256	4,345	4,085	96	2.2%	-6.0%	-3.8%	10,585	9,135	215	2.0%	-13.7%	-11.7%
1982	1,154	1,256	4,085	3,268	107	2.6%	-20.0%	-17.4%	9,135	7,039	231	2.5%	-23.0%	-20.4%
1983	1,154	1,256	3,268	3,467	103	3.1%	6.1%	9.2%	7,039	7,195	213	3.0%	2.2%	5.2%
1984	1,169	1,256	3,467	2,916	81	2.3%	-15.9%	-13.6%	7,195	5,821	162	2.3%	-19.1%	-16.8%
1985	1,172	1,256	2,916	2,315	120	4.1%	-20.6%	-16.5%	5,821	4,453	230	3.9%	-23.5%	-19.6%
1986	1,171	1,265	2,315	2,197	107	4.6%	-5.1%	-0.5%	4,453	4,180	203	4.6%	-6.1%	-1.6%
1987	1,171	1,256	2,197	2,399	83	3.8%	9.2%	13.0%	4,180	4,371	152	3.6%	4.6%	8.2%
1988	1,170	1,256	2,399	2,666	32	1.3%	11.1%	12.4%	4,371	4,650	55	1.3%	6.4%	7.7%
1989	1,208	1,256	2,666	2,855	99	3.7%	7.1%	10.8%	4,650	4,759	165	3.5%	2.3%	5.9%
1990	1,211	1,256	2,855	2,940	100	3.5%	3.0%	6.5%	4,759	4,620	157	3.3%	-2.9%	0.4%
1991	1,200	1,256	2,940	2,999	131	4.5%	2.0%	6.5%	4,620	4,572	200	4.3%	-1.0%	3.3%
1992	1,198	1,256	2,999	3,149	18	0.6%	5.0%	5.6%	4,572	4,666	26	0.6%	2.0%	2.6%
1993	1,198	1,255	3,149	3,338	138	4.4%	6.0%	10.4%	4,666	4,812	199	4.3%	3.1%	7.4%
1994	1,202	1,255	3,338	3,605	104	3.1%	8.0%	11.1%	4,812	5,062	146	3.0%	5.2%	8.2%
1995	1,202	1,255	3,605	3,921	151	4.2%	8.8%	13.0%	5,062	5,370	207	4.1%	6.1%	10.2%
1996	1,202	1,255	3,921	4,189	153	3.9%	6.8%	10.8%	5,370	5,553	203	3.8%	3.4%	7.2%
1997	1,202	1,255	4,189	4,485	125	3.0%	7.1%	10.0%	5,553	5,846	163	2.9%	5.3%	8.2%
1998	1,202	1,255	4,485	4,233	136	3.0%	-5.6%	-2.6%	5,846	5,429	174	3.0%	-7.1%	-4.1%
1999	1,202	1,256	4,233	4,092	132	3.1%	-3.3%	-0.2%	5,429	5,111	165	3.0%	-5.9%	-2.8%
2000	1,202	1,256	4,092	4,234	142	3.5%	3.5%	6.9%	5,111	5,116	172	3.4%	0.1%	3.4%
2001	1,202	1,256	4,234	4,290	134	3.2%	1.3%	4.5%	5,116	5,104	159	3.1%	-0.2%	2.9%
2002	1,202	1,256	4,290	4,459	132	3.1%	3.9%	7.0%	5,104	5,182	154	3.0%	1.5%	4.5%
2003	1,202	1,256	4,459	4,785	194	4.4%	7.3%	11.7%	5,182	5,458	222	4.3%	5.3%	9.6%
2004	1,202	1,256	4,785	5,539	240	5.0%	15.7%	20.8%	5,458	6,119	265	4.9%	12.1%	17.0%
2005	1,202	1,256	5,539	6,031	147	2.6%	8.9%	11.5%	6,119	6,442	157	2.6%	5.3%	7.9%
2006	1,215	1,256	6,031	6,324	229	3.8%	4.9%	8.7%	6,442	6,589	238	3.7%	2.3%	6.0%
2007	1,215	1,256	6,324	7,338	188	3.0%	16.0%	19.0%	6,589	7,345	188	2.9%	11.5%	14.3%
2008	1,216	1,256	7,338	8,663	292	4.0%	18.1%	22.0%	7,345	8,663	292	4.0%	18.0%	21.9%

Table A.15. Northern Farm Portfolio Financial Data (all dollars are in thousands).

Northern Illinois Farm Portfolio (Weber, Wright)

Crop Year	Tillable Acres	Total Acres	Beginning of Year Asset Value	End of Year Asset Value	Net Income	Nominal Cash Return	Nominal Land Value Change	Nominal Total Return	Beginning of Year Asset Value (2008 Dollars)	End of Year Asset Value (2008 Dollars)	Net Income (2008 Dollars)	Real Cash Return	Real Land Value Change	Real Total Return
1970	1,692	1,752	$1,464	$1,653	$35	2.4%	12.9%	15.3%	$ 8,165	$ 8,733	$183	2.2%	7.0%	9.2%
1971	1,692	1,752	1,653	1,719	44	2.7%	4.0%	6.7%	8,733	8,795	226	2.6%	0.7%	3.3%
1972	1,638	1,694	1,719	1,840	93	5.4%	7.0%	12.4%	8,795	9,101	461	5.2%	3.5%	8.7%
1973	1,638	1,694	1,840	2,373	145	7.9%	29.0%	36.9%	9,101	10,800	659	7.2%	18.7%	25.9%
1974	1,638	1,694	2,373	3,014	127	5.3%	27.0%	32.3%	10,800	12,209	514	4.8%	13.1%	17.8%
1975	1,638	1,694	3,014	3,828	197	6.5%	27.0%	33.5%	12,209	14,500	745	6.1%	18.8%	24.9%
1976	1,638	1,694	3,828	5,436	90	2.4%	42.0%	44.4%	14,500	19,635	326	2.2%	35.4%	37.7%
1977	1,634	1,694	5,436	5,816	110	2.0%	7.0%	9.0%	19,635	19,690	373	1.9%	0.3%	2.2%
1978	1,596	1,694	5,816	6,282	151	2.6%	8.0%	10.6%	19,690	19,506	469	2.4%	-0.9%	1.4%
1979	1,624	1,694	6,282	6,658	171	2.7%	6.0%	8.7%	19,506	18,250	468	2.4%	-6.4%	-4.0%
1980	1,629	1,694	6,658	6,792	207	3.1%	2.0%	5.1%	18,250	16,545	504	2.8%	-9.3%	-6.6%
1981	1,654	1,694	6,792	6,384	125	1.8%	-6.0%	-4.2%	16,545	14,278	281	1.7%	-13.7%	-12.0%
1982	1,616	1,694	6,384	5,107	131	2.0%	-20.0%	-18.0%	14,278	11,001	282	2.0%	-23.0%	-21.0%
1983	1,616	1,694	5,107	5,419	196	3.8%	6.1%	9.9%	11,001	11,246	408	3.7%	2.2%	5.9%
1984	1,618	1,694	5,419	4,557	108	2.0%	-15.9%	-13.9%	11,246	9,098	215	1.9%	-19.1%	-17.2%
1985	1,622	1,694	4,557	3,618	130	2.8%	-20.6%	-17.8%	9,098	6,960	249	2.7%	-23.5%	-20.8%
1986	1,624	1,694	3,618	3,434	123	3.4%	-5.1%	-1.7%	6,960	6,533	233	3.3%	-6.1%	-2.8%
1987	1,624	1,694	3,434	3,750	150	4.4%	9.2%	13.6%	6,533	6,831	274	4.2%	4.6%	8.8%
1988	1,625	1,694	3,750	4,166	49	1.3%	11.1%	12.4%	6,831	7,268	85	1.2%	6.4%	7.6%
1989	1,625	1,694	4,166	4,462	121	2.9%	7.1%	10.0%	7,268	7,439	202	2.8%	2.3%	5.1%
1990	1,610	1,694	4,462	4,596	121	2.7%	3.0%	5.7%	7,439	7,221	190	2.6%	-2.9%	-0.4%
1991	1,610	1,694	4,596	4,688	71	1.6%	2.0%	3.6%	7,221	7,146	109	1.5%	-1.0%	0.5%
1992	1,617	1,694	4,688	4,875	142	3.0%	4.0%	7.0%	7,146	7,223	210	2.9%	1.1%	4.0%
1993	1,616	1,694	4,875	5,216	177	3.6%	7.0%	10.6%	7,223	7,522	256	3.5%	4.1%	7.7%
1994	1,612	1,694	5,216	5,634	164	3.1%	8.0%	11.1%	7,522	7,912	230	3.1%	5.2%	8.3%
1995	1,612	1,694	5,634	6,101	178	3.2%	8.3%	11.4%	7,912	8,355	244	3.1%	5.6%	8.7%
1996	1,612	1,694	6,101	6,552	190	3.1%	7.4%	10.5%	8,355	8,685	252	3.0%	3.9%	7.0%
1997	1,612	1,694	6,552	7,010	187	2.9%	7.0%	9.9%	8,685	9,137	244	2.8%	5.2%	8.0%
1998	1,612	1,694	7,010	6,647	153	2.2%	-5.2%	-3.0%	9,137	8,525	197	2.2%	-6.7%	-4.5%
1999	1,612	1,693	6,647	6,447	138	2.1%	-3.0%	-0.9%	8,525	8,053	172	2.0%	-5.5%	-3.5%
2000	1,612	1,693	6,447	6,675	127	2.0%	3.5%	5.5%	8,053	8,065	153	1.9%	0.1%	2.1%
2001	1,612	1,693	6,675	6,765	131	2.0%	1.3%	3.3%	8,065	8,048	156	1.9%	-0.2%	1.7%
2002	1,612	1,693	6,765	7,061	119	1.8%	4.4%	6.1%	8,048	8,206	139	1.7%	2.0%	3.7%
2003	1,612	1,693	7,061	7,614	138	2.0%	7.8%	9.8%	8,206	8,686	158	1.9%	5.9%	7.8%
2004	1,612	1,693	7,614	8,909	203	2.7%	17.0%	19.7%	8,686	9,842	224	2.6%	13.3%	15.9%
2005	1,612	1,693	8,909	9,861	234	2.6%	10.7%	13.3%	9,842	10,534	250	2.5%	7.0%	9.6%
2006	1,644	1,693	9,861	10,690	263	2.7%	8.4%	11.1%	10,534	11,136	274	2.6%	5.7%	8.3%
2007	1,644	1,693	10,690	12,808	132	1.2%	19.8%	21.0%	11,136	12,819	132	1.2%	15.1%	16.3%
2008	774	800	4,763	5,143	183	3.8%	8.0%	11.8%	4,767	5,143	183	3.8%	7.9%	11.7%

APPENDIX B

Table B.1. Correlations of Total Return Between Asset Classes 1962-1970.

Asset Class	Large Company Stocks	Small Company Stocks	Long-Term Corporate Bonds	Long-Term Gov't Bonds	Intermediate-Term Gov't Bonds	U.S. Treasury Bills	UI Farmland Portfolio	Market Portfolio	Consumer Price Index
Large Company Stocks	1.00	0.83	(0.07)	(0.34)	(0.19)	(0.34)	0.23	0.96	(0.35)
Small Company Stocks		1.00	(0.35)	(0.60)	(0.40)	(0.38)	0.20	0.94	(0.35)
Long-Term Corporate Bonds			1.00	0.91	0.93	0.02	0.09	(0.12)	(0.04)
Long-Term Gov't Bonds				1.00	0.82	(0.01)	0.22	(0.40)	(0.09)
Intermediate-Term Gov't Bonds					1.00	0.34	(0.05)	(0.22)	0.28
U.S. Treasury Bills						1.00	(0.48)	(0.39)	0.97
UI Farmland Portfolio							1.00	0.27	(0.67)
Market Portfolio								1.00	(0.39)
Consumer Price Index									1.00

Table B.2. Correlations of Total Return Between Asset Classes 1971-1980.

Asset Class	Large Company Stocks	Small Company Stocks	Long-Term Corporate Bonds	Long-Term Gov't Bonds	Intermediate-Term Gov't Bonds	U.S. Treasury Bills	UI Farmland Portfolio	Market Portfolio	Consumer Price Index
Large Company Stocks	1.00	0.82	0.48	0.28	0.36	0.05	(0.19)	0.97	(0.21)
Small Company Stocks		1.00	0.42	0.27	0.33	0.10	(0.14)	0.92	(0.07)
Long-Term Corporate Bonds			1.00	0.89	0.83	(0.72)	0.47	0.57	(0.80)
Long-Term Gov't Bonds				1.00	0.92	(0.66)	0.48	0.39	(0.69)
Intermediate-Term Gov't Bonds					1.00	(0.38)	0.60	0.47	(0.47)
U.S. Treasury Bills						1.00	(0.24)	0.00	0.94
UI Farmland Portfolio							1.00	(0.07)	(0.12)
Market Portfolio								1.00	(0.22)
Consumer Price Index									1.00

Table B.3. Correlations of Total Return Between Asset Classes 1981-1990.

Asset Class	Large Company Stocks	Small Company Stocks	Long-Term Corporate Bonds	Long-Term Gov't Bonds	Intermediate-Term Gov't Bonds	U.S. Treasury Bills	UI Farmland Portfolio	Market Portfolio	Consumer Price Index
Large Company Stocks	1.00	0.63	0.62	0.59	0.45	(0.33)	(0.12)	0.96	(0.61)
Small Company Stocks		1.00	0.36	0.30	0.31	0.21	(0.18)	0.80	(0.16)
Long-Term Corporate Bonds			1.00	0.98	0.95	(0.02)	(0.72)	0.68	(0.51)
Long-Term Gov't Bonds				1.00	0.95	0.01	(0.73)	0.64	(0.48)
Intermediate-Term Gov't Bonds					1.00	0.26	(0.83)	0.54	(0.29)
U.S. Treasury Bills						1.00	(0.46)	(0.16)	0.69
UI Farmland Portfolio							1.00	(0.23)	0.08
Market Portfolio								1.00	(0.53)
Consumer Price Index									1.00

Table B.4. Correlations of Total Return Between Asset Classes 1991-2000.

Asset Class	Large Company Stocks	Small Company Stocks	Long-Term Corporate Bonds	Long-Term Gov't Bonds	Intermediate-Term Gov't Bonds	U.S. Treasury Bills	UI Farmland Portfolio	Market Portfolio	Consumer Price Index
Large Company Stocks	1.00	0.54	0.40	0.27	0.32	0.36	(0.10)	0.94	(0.52)
Small Company Stocks		1.00	0.32	0.18	0.26	0.08	0.26	0.75	0.18
Long-Term Corporate Bonds			1.00	0.97	0.97	0.35	0.21	0.59	(0.10)
Long-Term Gov't Bonds				1.00	0.97	0.35	0.19	0.45	(0.10)
Intermediate-Term Gov't Bonds					1.00	0.36	0.03	0.50	(0.04)
U.S. Treasury Bills						1.00	(0.15)	0.34	0.05
UI Farmland Portfolio							1.00	0.08	0.31
Market Portfolio								1.00	(0.32)
Consumer Price Index									1.00

Table B.5. Correlations of Total Return Between Asset Classes 2001-2008.

Asset Class	Large Company Stocks	Small Company Stocks	Long-Term Corporate Bonds	Long-Term Gov't Bonds	Intermediate-Term Gov't Bonds	U.S. Treasury Bills	UI Farmland Portfolio	Market Portfolio	Consumer Price Index
Large Company Stocks	1.00	0.84	(0.64)	(0.86)	(0.83)	0.13	0.15	0.98	0.57
Small Company Stocks		1.00	(0.30)	(0.87)	(0.74)	(0.08)	(0.22)	0.92	0.20
Long-Term Corporate Bonds			1.00	0.48	0.50	(0.50)	(0.40)	(0.54)	(0.36)
Long-Term Gov't Bonds				1.00	0.78	(0.38)	0.25	(0.88)	(0.43)
Intermediate-Term Gov't Bonds					1.00	(0.02)	(0.08)	(0.83)	(0.41)
U.S. Treasury Bills						1.00	(0.17)	0.04	0.37
UI Farmland Portfolio							1.00	0.06	0.40
Market Portfolio								1.00	0.46
Consumer Price Index									1.00

Table B.6. Correlations of Total Return Between Asset Classes 1962-1986.

Asset Class	Large Company Stocks	Small Company Stocks	Long-Term Corporate Bonds	Long-Term Gov't Bonds	Intermediate-Term Gov't Bonds	U.S. Treasury Bills	UI Farmland Portfolio	Market Portfolio	Consumer Price Index
Large Company Stocks	1.00	0.74	0.40	0.28	0.27	(0.01)	(0.17)	0.96	(0.21)
Small Company Stocks		1.00	0.03	(0.07)	(0.05)	(0.03)	0.04	0.87	(0.05)
Long-Term Corporate Bonds			1.00	0.96	0.94	0.09	(0.34)	0.39	(0.38)
Long-Term Gov't Bonds				1.00	0.93	0.14	(0.37)	0.27	(0.32)
Intermediate-Term Gov't Bonds					1.00	0.37	(0.42)	0.26	(0.17)
U.S. Treasury Bills						1.00	(0.36)	(0.02)	0.63
UI Farmland Portfolio							1.00	(0.07)	0.22
Market Portfolio								1.00	(0.19)
Consumer Price Index									1.00

Table B.7. Correlations of Total Return Between Asset Classes 1987-2008.

Asset Class	Large Company Stocks	Small Company Stocks	Long-Term Corporate Bonds	Long-Term Gov't Bonds	Intermediate-Term Gov't Bonds	U.S. Treasury Bills	UI Farmland Portfolio	Market Portfolio	Consumer Price Index
Large Company Stocks	1.00	0.70	0.17	(0.05)	(0.04)	0.38	(0.13)	0.97	0.16
Small Company Stocks		1.00	0.16	(0.14)	(0.16)	(0.07)	(0.09)	0.84	(0.10)
Long-Term Corporate Bonds			1.00	0.89	0.86	0.13	(0.03)	0.30	(0.10)
Long-Term Gov't Bonds				1.00	0.90	0.05	0.11	0.04	(0.20)
Intermediate-Term Gov't Bonds					1.00	0.24	(0.08)	0.03	(0.05)
U.S. Treasury Bills						1.00	(0.24)	0.26	0.63
UI Farmland Portfolio							1.00	(0.10)	0.19
Market Portfolio								1.00	0.07
Consumer Price Index									1.00

Table B.8. Correlations of Total Return Between Asset Classes 1962-2002.

Asset Class	Large Company Stocks	Small Company Stocks	Long-Term Corporate Bonds	Long-Term Gov't Bonds	Intermediate-Term Gov't Bonds	U.S. Treasury Bills	UI Farmland Portfolio	Market Portfolio	Consumer Price Index
Large Company Stocks	1.00	0.66	0.34	0.27	0.22	0.09	(0.12)	0.95	(0.18)
Small Company Stocks		1.00	0.07	(0.02)	(0.02)	0.00	0.05	0.82	(0.04)
Long-Term Corporate Bonds			1.00	0.95	0.94	0.05	(0.28)	0.39	(0.34)
Long-Term Gov't Bonds				1.00	0.93	0.08	(0.28)	0.31	(0.30)
Intermediate-Term Gov't Bonds					1.00	0.29	(0.34)	0.27	(0.14)
U.S. Treasury Bills						1.00	(0.27)	0.06	0.66
UI Farmland Portfolio							1.00	(0.04)	0.24
Market Portfolio								1.00	(0.16)
Consumer Price Index									1.00

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